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THE AMERICAN GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

New England Association of Gas Engineers.

BIRMINGHAM, CONN., January 16, 1889.

The annual meeting of the New England Association of Gas Engineers will be held at Youngs' Hotel, Boston, on Wednesday and Thursday, February 20 and 21, 1889. The meeting will be called to order on Wednesday, at 10 o'clock A.M., by the President, Hon. A. M. Norton.

It can now be stated that seven papers have been definitely promised, and several others conditionally. From the character of the authors it can be safely guaranteed that the coming meeting will be a very interesting one, and that all who attend will be well repaid by the papers alone. It only remains for the members, by a full attendance and taking an active interest in the discussions, to make this meeting as successful, if not the most successful one in the history of the Association. The authors and subjects will be announced in the next issue of the JOURNAL.

Persons eligible for membership, either as active or associate members, and wishing to join the Association, will please send their names to the Secretary at once, who will immediately forward them blank forms of application.

Any member of the Association wishing to have any particular subject discussed will please notify the Secretary, who will in turn notify the members of the Association of the same, so as to enable all to come prepared to discuss the subjects more intelligently than otherwise would be possible.

CHAS. H. NETTLETON, Secy.

[OFFICIAL NOTICE.]

Fifth Annual Meeting Ohio Gas Light Association.

OFFICE OF SECRETARY,
COLUMBUS, O., January 15, 1889.

To Members of the Ohio Gas Light Association: The Fifth Annual Meeting of this Association will be held at Mansfield, Ohio, March 20 and 21, 1889.

All members are urged to begin now to make arrangements for attending this meeting; and all persons eligible for membership, who have not already joined the Association, are earnestly invited to meet with us at Mansfield and become members. No live gas company in the State can afford not to be represented at the meetings of the Association; and if any company should fail to appreciate this fact, its active superintendent or manager, and, in fact, every man who expects to earn his daily bread in the gas industry, can afford to attend the meetings at his own expense. Our membership now numbers 125, and our meetings are well attended. While it is, as yet, too early to make any definite announcements as to the Mansfield meeting, preparations are progressing satisfactorily, and it no doubt will compare favorably with the meetings heretofore held.

On December 19, 1888, the Secretary issued a circular to each of the 125 members, inclosing a self-addressed and stamped envelope for reply, requesting volunteer papers for the forthcoming meeting. Up to the present time, I have received but 46 responses, only one of which contained even a conditional promise to furnish a paper. As the success of the meeting, of course, depends upon our having a sufficient number of papers, it is hoped that those members who have not yet responded will do so, and that those who have, will reconsider the matter, and that all who possibly can will volunteer papers before being "drafted" by the Executive Committee.

Several members are considerably in arrears with their dues. This may be owing, in some instances, to their desire to withdraw from the Association. If there be any such, I would be pleased to receive a written notice to that effect *at once*, as required by the Constitution, in order that the necessary action may be taken by the Executive Committee.

If any death has occurred in our membership since our last meeting, I would esteem it a favor to be so notified by any member having knowledge of the fact.

I shall be pleased to furnish any member, or person seeking to become a member, with a copy of our Constitution, on application.

Respectfully,

IRVIN BUTTERWORTH, *Secretary.*

BRIEFLY TOLD.

THE proprietors of the Consumers Gas Company, Toronto, Canada, have determined to embark in the electric lighting business, and after a protracted investigation of the various systems submitted to their notice have selected the Westinghouse as the best adapted to their needs. As soon as they can obtain permission from the Corporation (their present charter permits them to prosecute this undertaking without any further State Legislative sanction), they will proceed with the work of installation and wiring.

WE have in course of preparation a history of the life of the late Philip P. Deily, whose death occurred in Philadelphia, Pa., on the evening of the 5th inst.

SECRETARY NETTLETON'S second official notice in respect of the coming meeting of the New England Association shows that a rare treat is in store for the members.

WE hope, too, that Secretary Butterworth in his next notice will be able to show that the Executive Committee shall not find it imperative to resort to the "drafting process."

THE GASHOLDER EXPI OSION, BROOKLYN, N. Y.

Residents of the southeastern portion of New York State were treated last March to a taste of all that a real Dakota blizzard implies, and it may be taken for granted that while that experience may have had its value, no one in this vicinity is in any sense desirous of having that experience amplified by another exemplification. Nor do I imagine that the blizzard's near relative, the cyclone—the essential difference between these affinities seems but to be the variation of blowing hot or blowing cold, according to the range of the seasons—will ever establish itself permanently in the regard of southeastern New York. After this much, by way of apology and explanation, it only remains to be introductorily noted that in the immediate vicinity of our lower bay, and thence over and through a certain well defined path, right in the lowest levels of New York and Brooklyn, was swept, at about 8 P.M. of January 9, by a cyclone of tremendous violenc, the amazing power of which is brought all the more sharply into prominence because of its remarkably short duration. Of course it is not my province, neither is it my desire, to trace this rush of the winds from its exit to its point of emergence but the fact is that its line of travel is sharply defined. It undoubtedty headed on from the Susquehanna Valley, in Pennsylvania, across the southern lowlands of New Jersey, striking New York Bay over or near a point due east of Bayonne, thence on by Bedloe's Island (Madame Liberty's torch was unextinguished, however), then, taking an erratic course, hugging the channel by the east bank of Staten Island, and through the Narrows, where it probably turned back from the resistance offered by the strong, steady south-southeast wind coming in from the Atlantic, and plunged over Long Island by way of the low valley of New Utrecht, thence closely hugging the low line channel framed on its eastern boundary by the range of hills which compose the southern line of what is known as the "backbone" of Long Island. Having so far traced, from major or minor evidences of wreck along this route, its progress, it is proper to say that, in common with all our winter season so far in this section, the temperature on the night in question was far out of proportion to the normal, the thermometer in Brooklyn having been read at 58° just 20 minutes before the real destruction began. Now, mark what seems to be a proof—heavy rains had been falling all day and evening—of the temporary checking of the cyclone where it encountered the Atlantic ocean head winds.

At 8:10 P.M. Brooklyn people noted that a great calm had taken the place of the steady blow of a few moments before. This calm lasted perhaps five minutes, when a roar as of falling water (literally, this was true, for the rain came down in immense volume) first startled the pedestrian, who, a moment later, in many instances, was absolutely thrown to the sidewalk, to the accompaniment of an ear-splitting report and a pronounced vibratory wave. The denouement to the whole was an illumination that those who have witnessed the spouting flames from a large natural gas well can alone appreciate. To go back a trifle. Our cyclone was left at the entrance to the backbone valley of Long Island, and it traveled on from there to the first real high ground directly in its path, the passage being made (over about 3½ miles of ground) in less than as many minutes. Unfortunately for the Citizens' Gas Light Company, its storage plant—composed of 3 holders—which, by the way, are located on the highest level of the land occupied, was the first object to be seized. This statement might be modified in the statement that holder No. 1, on the highest level (on the southwest corner of Smith and Fifth streets), was the one to suffer from the primal effect of the stroke. The 3 vessels—No. 1, a two-lift, was constructed in 1875, and put in duty in September of that year, had a capacity of 500,000 cu. ft.; Nos. 2 and 3, erected in 1860, being calculated to hold 250,000 cu. ft. each—were built in a line parallel with Fifth street, running east from Smith street. The No. 1 vessel was completely inflated at the time the cyclone struck it, hence it afforded a fair target for the blow. From the evidence of one's eyesight—the Company's officials are disinclined to say anything at all about the affair—it is fair to presume that the blow was delivered well up on the south side, to the top of the top section, hence the strain brought to bear on the column nearest the stroke snapped it off at the base, bringing down a guide or two with it, which, in its descent, may have punctured the sheets at a point or points in both sections. This unbalancing of the vessel may have broken the cup seals, and the gas which had escaped from the fractures in the sheets, primarily, on communicating with a naked light—a street jet was but 40 feet away—lighted back, until communication with the great body of gas escaping by way of the cups, already diluted with sufficient air, was made, and the explosion followed, the confined gas then taking flame as it issued, and burning in a flaring fashion This theory seems to be well sustained from the position of the dismantled holder, standing as it does with one-half its lower section resting over the coping, and spread upon the adjoining ground, with the entire top lift looming 26 feet in the air on this side, while the opposite side, the one upon which the effect of the concussion was most exerted, rests in the tank—the whole resting at an angle of about 45°. The sheets of flame from the gas fire in holder No. 1 swept over the next vessel in line, which was not more than 20 feet distant. Holder No. 2 is also a double lift, but fortunately, however, its top section only was up, having just cupped; and there is little doubt but that the falling debris smashed in the side adjoining its larger companion. The gas thus vented was at once ignited, and the section gradually settled until it again sealed itself. The damage to the columns of No. 2 is very slight, the guide on one column only showing the effect, and this by a section torn away.

No. 3 being similar in construction and capacity to No. 2, was about two-thirds up, and it was from this that the gas was passing out to the consumers. The shock experienced by it was undoubtedly similar to that encountered by holder No. 3, but being much older, the concussion following the explosion literally rent it in pieces.

The tanks apparently have received but very slight damage, and the entire property is covered by insurance, which undoubtedly is a good and collectible asset; for the St. Louis case, reported in your last, in which the insurance companies successfully resisted the claim of the old St. Louis Gas Light Company for insurance carried on a holder that *collapsed* on a *perfectly calm* night in the winter of 1884, has nothing in common with the case under review.

In conclusion, I am impelled to the remark that it is a queer freak which caused this loss to the Citizens Company, and in continuation of the oddity it remains to be said that although it took the combined force of storm and fire and explosion to wreck the storage plant of this corporation, time and neglect, although operating more slowly, will nevertheless act just as certainly and effectually in dismantling the Company's once well equipped manufacturing plant so well situated for the purpose on the west bank of what is known as Gowanus Canal. It is a pity that moss should grow where fires should blaze; but the proprietors must be considered the best judges. I thus generalize since I suppose that all your readers are aware of the fact that the Citizens Company, under the terms of what might be called the "Brooklyn gas deal," long ago shut down its manufacturing plant in order that it might occupy the position of a middleman between the Fulton-Municipal Company and its own (the Citizens) consumers. In connection with this phase of the case it may be said that the consumers in the district affected—which embraces a large and populous section of southwestern Brooklyn—were without gas for perhaps but half an hour. This was effected by making direct connection between the mains of the Fulton-Municipal and the Citizens Companies.

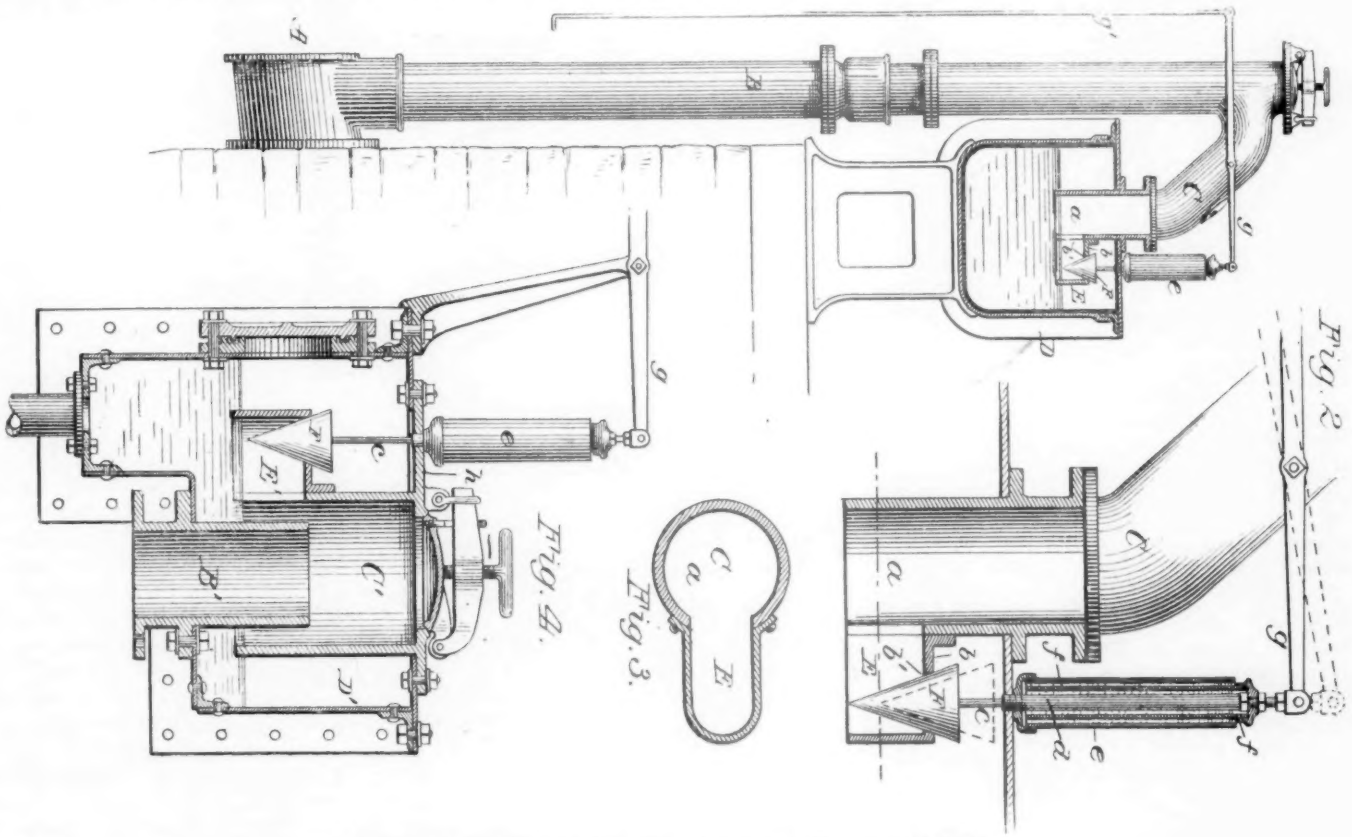
W. H.

[Third Article.]

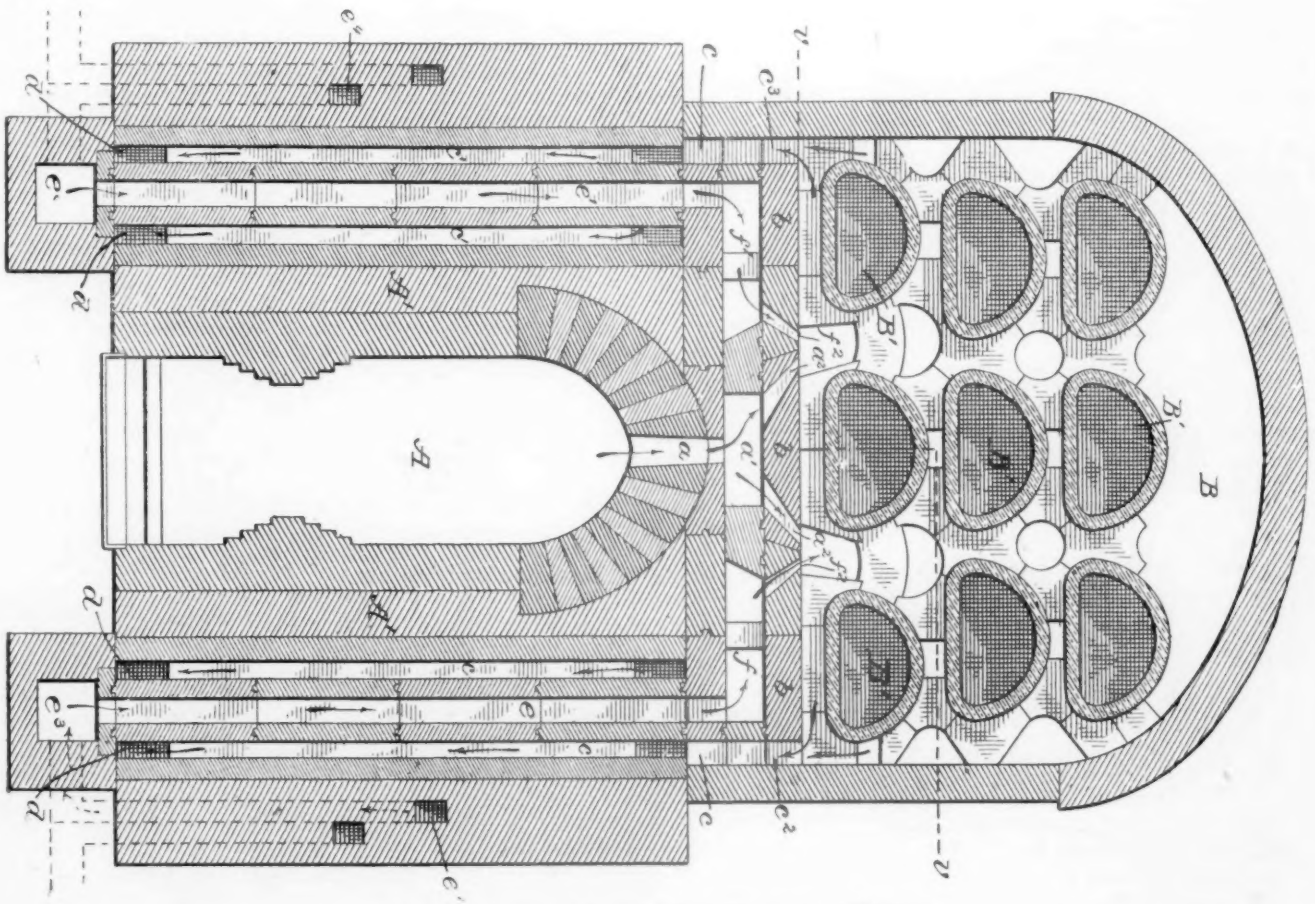
A Review of Patents Invented and Inventions Patented in the Gas Interest the Past Year.

By Frederic Egner.

In the second article (*ante*, p. 3) of this series the hydraulic main invented by Messrs. McIlhenny and Lansden was mentioned. It is herewith illustrated. To a practical gas man the cuts will sufficiently explain the device. The mouthpiece of retort *A*, ascension-pipe *B*, dip-pipe *C*, and hydraulic main *D*, are plainly enough shown to be easily understood. The valve chamber *E*, the top of which, *b*, contains the valve-seat for the plug-valve *F*, are the new additions. When the plug *F* is raised by the device plainly shown, the dip or eduction pipe is bye-passed until *F* is again closed, when the seal is restored, as shown.



The McIlhenny and Lansden Improved Hydraulic Main.



The McIlhenny Recuperating Furnace—Fig. 1.

There are a number of devices for bye-passing the seal in the hydraulic main. A very simple device—used for some 16 or more years in the works of the former Metropolitan Gas Light Company, of New York city—consisted of a 1½-inch or 2-inch gas pipe drilled and screwed in the bridge-pipes (above the seat, of course) at one end, and the hydraulic at the other, with a cast iron stopcock between. That device was patented some six years after we had used it at the works mentioned. After the charge was put into the retort the cock would be opened, and, before "slacking out," closed again.

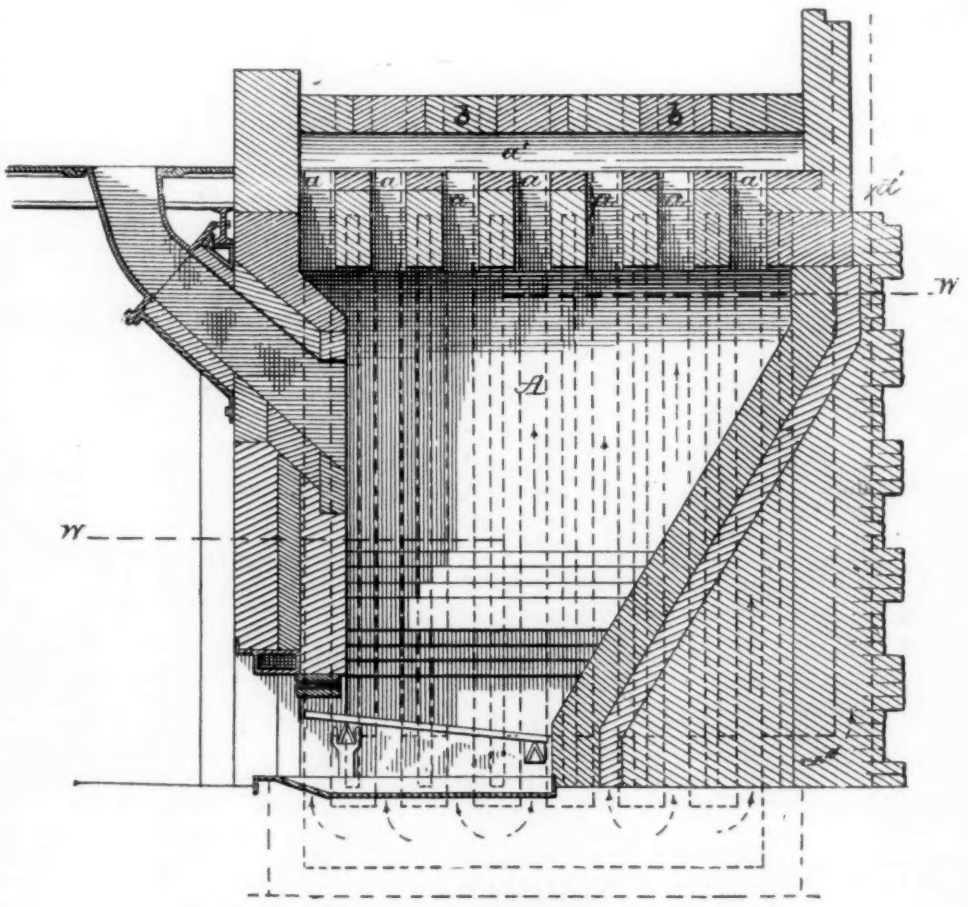
The device of Messrs. McIlhenny and Lansden seems to the writer to be both simple and effective, but would be better if worked in connection with Isbell's or Boardman's patent hydraulic main. There is a positive advantage to the gas maker in bye-passing the seal of the dip-pipe. One of the principal items in favor of the anti-dip is that the retorts will not have to be scured near as often.

Mr. McIlhenny has also patented a retort bench furnace, two illustrations of which are given. In a former device of this engineer he heated the air to be used in the furnace by drawing the same, by means of an exhauster, through a vessel fixed above the waste flues of the bench, and forced the air thus heated down into the furnace. It was the writer's opinion at the time when that invention was made public that it was only a question of time when it would be abandoned by the inventor. The cuts presented show this to have been done; and in the body of the specifications the inventor himself mentions the matter. The distinguishing features of this recuperating furnace are that, instead of using a number of horizontal flues to heat the air to be used, the inventor employs only one large horizontal main flue on each side of the furnace, and a number of vertical or "diving flues," as he calls them, leading up and down each side of the combustion chamber and into the same at the end.

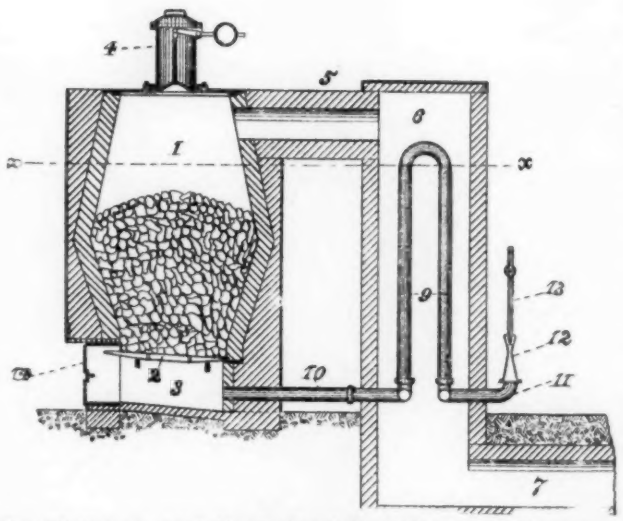
The next illustration is that of a fuel gas producer furnace, patented by Messrs. Wellman and Goetz. This furnace is a fair sample of all that class of producers in which air and steam are employed together in the production of fuel gas. The special distinguishing feature of the Wellman and Goetz producer plant is that the air used is caused to pass through pipes, which are placed in a chamber through which the hot gases from the producer must pass on their way to the gas flue or main. It is claimed that by thus first heating the air the result is greater economy and better working of the producers. In the cut, Fig. 1 is a section of a side elevation, and Fig. 2 a plan of the producer and air-heating chamber on the line $x x$, Fig. 1. In the cut, 1 is the producer, having an ashpit, 3, with air-tight door, 14, ashpit, 3, charging chute, 4, take-off flue, 5, superheating chamber, 6, main gas flue, 7, to which a number of producers must be connected. The air-pipe and steam-jet are designated by the numbers 9, 10, 11, 12, and 13. A number of producers like the one described, but without the superheating chambers, which form the basis of the claims of the patent under consideration, have been for a long time in operation at the works of the Shickle, Harrison and Howard Iron Company, at St. Louis, Mo., and with the best of success. That enterprising Company has constructed and is operating a large fuel gas plant at their own immense works, heating boilers, and everything that formerly required coal or coke, by means of gas fires; the saving effected in that way running away up into the thousands of dollars every week. It is not pretended that the gas made in the above apparatus can be stored and conducted to any great distance to advantage; but if used constantly, and near at hand to the producer, it certainly is a clear, practically demonstrated solution, on a large scale, of the smoke nuisance complained of in so many cities.

The fuel used in the producers of the Shickle, Harrison and Howard Iron Company, is bituminous slack coal.

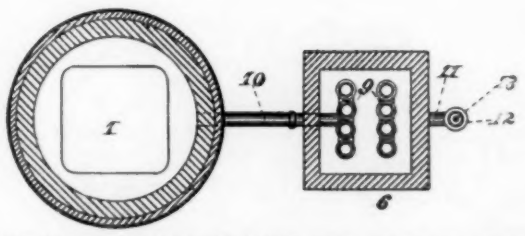
The illustrations to follow will show one of the ideas of Mr. Henry C. Rew as to what, in his opinion, would be the best form of gas generating apparatus. The subjects of the illustrations are to be from patent No. 389,103. As the inventor named has taken out some nine patents for process and apparatus for making gas, a review of his inventions alone would furnish material enough for one or more large articles, and may be taken up at some future date. At present a brief de-



The McIlhenny Recuperating Furnace.—Fig. 2.



The Wellman and Goetz Fuel Gas Producer Furnace. Fig. 1.



The Wellman and Goetz Fuel Gas Producer Furnace. Fig. 2.

scription of the patent mentioned must suffice. The distinguishing feature of the Rew apparatus is, mainly, that the superheating checker-brick chamber, usually seen in water gas apparatus at one side or above the generator, is in this case directly beneath it; the object being, as the inventor claims, to take the greatest possible advantage of the tendency of the heat to rise. Theodore G. Springer, in patent No. 280,770, of July 3, 1883, and also in patent No. 284,985, of September 11, same year, also speaks of this advantage, and shows the superheater below the generator, but he does not show all the other features seen in the Rew patents.

[To be continued.]

Flexible Foundations.

Engineering notes that the ordinary conception of a foundation is that its virtue is in exact proportion to its rigidity, and that the more unyielding it is the better it serves its purpose. And while this assumption may be true in supporting a heavy load, yet, where questions of impact enter, the "soft answer will turn away wrath" as well in dynamics as in polemics.

At a factory in the United States some bevelled gears which were used to change the direction of main shafting from one mill to another were at the end of very heavy shafts, which ran in pillow blocks, simply bolted to an outcropping ledge, which was dressed to a level for the purpose of sustaining the foundations. Some of the teeth of these bevelled gears would break from time to time, and in a most unaccountable manner. The accident might be deferred for three months, or it might occur at any moment. Various expedients were tried, and finally that of taking up the pillow blocks and placing them on seats of raw hide which had been soaked in oil; these gave the bearings enough elasticity to prevent a concentration of shocks upon the teeth of the gear, and in that way acted as a buffer preventing the gears from committing a mechanical suicide.

A steam engine used to operate the dynamos for lighting an insurance building in New York, gave a great deal of annoyance to the occupants by the jar which was transmitted throughout the building. It is supposed that the motion of the engine was in rhythm with the key-note of the building. The makers of several engines tried to solve the problem, which was at last achieved by one firm, who bolted the bed of their engine to a timber raft, which rested upon a layer of hair felt such as is used for non-conducting coverings for steam pipes and boilers, but 14 inches thick. This felt was placed upon the masonry foundation recently prepared for the engine, and surrounded by a heavy timber box which prevented its spreading.

An engine used to operate an electric light plant in one of the principal hotels in New York city gave annoyance to the guests because, when it was in operation, beats could be heard all over the building, notwithstanding that the engine was situated in a tightly-closed room in the basement. After various other expedients had failed, the doors to this room were taken down and replaced by double thicknesses of carpet fixed upon the framework. This served to break up the rhythm in such a way that the sound was not heard through the building.

Sawdust has been used for foundations in many instances, and there are numerous towns in the United States which have been built up from small villages originally around a sawmill, and the sawdust from the mill has been used to fill up low places, which have afterwards served as building lots. In course of time such filling becomes very compact, and does not appear to waste by decay.

The Danger of Electric Distribution.

The *Scientific American*, in an editorial on this subject, says: Notwithstanding the susceptibility of the public mind to suggestions of alarm, it is doubtful if a full realization of the risk to which the members of the community are exposed from electric wires has been generally attained.

Electric companies, whether supplying current for lamps or motors, have every inducement to increase the danger inevitably attendant upon their installation. The cheapest wire is the uncoated one. A wire, however insulated, costs more; a properly insulated one is still more expensive. The quality of the insulation at the start is only one element—its duration when exposed to the weather is another. Insuring the latter gives a further increase in cost. As the network of wires grows thicker, and as the lines cross each other more often, an additional cause of deterioration appears. The contact of swinging wires with one another tends to rub off the insulation and expose the metal. The lines which have done the damage then serve as conductors to carry off the current, possibly to a telephone box or other place where it may do much harm.

Recent experiments in death by electricity which have been made upon animals illustrate the fatal nature of the dynamic shock. In the early days of the science the static discharge of immense potential and very small quantity was considered the most fatal. It corresponded to the lightning stroke, both in its electrical characteristics and effects. Following the developments of the last decade, dynamic currents of very high intensity are everywhere in use, and these have been found to be deadly, though of comparatively low potential. It is such currents as these that imperfectly protected wires are carrying above the streets. When the dynamos are running, contact with wires conveying such currents is liable to be fatal. A broken wire that has fallen so as to reach from the top of a pole to the street has now come to be regarded as dangerous to the populace. The dread is only too just. Repeated deaths have proved it so.

It is futile to attempt to restrain the march of progress. No advance in practical science is more remarkable than the development of electricity. Goethe's prediction, true for so many years, is now being falsified. He said that electricity would only be applied to the minor uses of life. Now engines are driven by it, and the difficulties in the way of application to outdoor locomotors are gradually disappearing. The electric light is practically complete in its development. But while no effort should be made to restrict the uses of the current, the fact that it is dangerous should not be overlooked.

The rival exploiters of different systems claim each a higher degree of safety, or, more properly, a less degree of danger, for his own installation. The direct and alternating current advocates are engaged in active attack upon each other on the basis of the relative harmfulness of the two systems. One engineer has suggested a species of electric duel to settle the matter. He proposes that he shall receive the direct current, while his opponent shall receive the alternating current. Both are to receive it at the same voltage, and it is to be gradually increased until one succumbs, and voluntarily relinquishes the contest. The absurdity of the suggestion, which is made in apparent earnestness, shows how decided the war has become. Back of it all the fact remains that the working current of the day, direct or alternating, is dangerous. One solution seems adapted to protect the public. It is to properly dispose of the wires underground.

In examining the effects of the dynamic current upon the systems of animals, several points of interest have been developed. One such point is the small amperage required for a fatal result. Thus, with a current of 536 volts electromotive force a dog with a resistance of 11,000 ohms was killed. This reduces to a current of less than 0.05 ampere, leaving out of consideration the resistance of the dynamo. A horse weighing 1,230 pounds was killed by a current of about 0.06 ampere. In the case of the alternating current the question of time seems to enter. A current requires a certain period to destroy life, which period varies with the current intensity. These data go to prove how slight a contact with the wires may prove fatal. Sooner or later the plan of a modern city will have to provide some effective system of subways. The overhead wires will be a perpetual menace, will be the cause of death and injury.

But a few days have elapsed since a forcible illustration of these dangers occurred. A storekeeper in Meriden, Conn., started to take in some articles of clothing that had been hung up in front of his store. It was raining at the time. He was thrown violently back by an electric shock as soon as he attempted to remove a knit jacket. He soon recovered and continued his work, only to receive an additional shock which scorched his hand. The attention of bystanders was excited, and it was found that brilliant flashes of light could be drawn from the iron front of the store. On investigation it was found that an electric light wire had come in contact with the wet awning, and thus had caused the trouble. Here at least is a case where it would be hard for the electric light company to plead contributory negligence.

THE proprietors of the Chico (Cal.) Gas Company have determined to install an electric light and power plant.

AT the last regular monthly meeting of the Directors of the Belleville (Ills.) Gas Light Company, a resolution was passed authorizing Supt. Harry Maguire to announce that, beginning with the 1st inst., the gross price for gas was to be placed at $2.50 per 1,000 cubic feet, and that prompt payment (between the second and sixth days of each month)

would secure a rebate of 75 cents per 1,000. Supt. Maguire must have been putting his house in order last summer, in order to see his way clear to advising his Board to take this action. The new rate is a low one for gas in Belleville.

Notes and Comments.

By Observer.

It is said of the Duke of Wellington that, after witnessing some experiments with gun cotton, when asked for his opinion respecting the new explosive, replied that if gunpowder had been discovered since gun cotton, people would say, "What an improvement it is!" I think the same remarks may be applied to gas to-day. This little reddened wire which we call the incandescent electric light does not give as good a light as gas, at the point of consumption; neither does it diffuse its light as well. It is what may be termed a "dead light," and it compares with gas neither in life nor brilliancy. My experience is that to be able to see clearly by its aid we have to get close to it.

By way of illustration, I would like to instance the lighting of a leading hotel in the West. When on a recent visit there I perceived that incandescent lamps had been placed in the dining room, office, rotunda, reading room, etc.; and I also observed that in place of one gas jet, two of the incandescent lamps had been substituted. In plain English, it took twice as many incandescents as it did of gas to light the premises. And now comes the question from the reader, "Is the hotel well-lighted?" to which I reply, "No sir, it is not;" and I venture to say further, that if that hotel were as poorly illuminated by gas as it is now by incandescent lamps, the gas company in that city would hear before breakfast all about its incompetency.

Some time ago I visited a small town in Wisconsin, which rejoices in the possession of a magnificent water power. While seated in the hotel office, and disposed to be impartial, for I had enjoyed a good supper, I discovered that the room was illuminated by incandescent electric lamps. I remarked about it to the proprietor, who was near by, and asked him as to its satisfactoriness and cost. He replied that he liked it pretty well, but that it cost him about three times as much as did his former gas supply. This astounding admission impelled me to inquire why he kept up the service, to which he made answer: "The electric light man came here and offered to light my hotel for a certain sum for the entire year—at that time the gas was bad—and I accepted the offer, but," he added, "when the contract expires I shall be free to return to gas, if I desire to do so." This conversation opened my eyes to one thing, if to no other, which is that the electric light man has one advantage over the gas man with the consumer. He tells the latter in advance the amount of his bill, and that is quite an important factor with many. On the other hand, the gas man has many advantages over his competitor.

I think it is generally understood that the incandescent is a more expensive light than gas, light for light. This is even acquiesced in by the electric light promoters themselves. It is always a pleasure to quote an authority on any given subject; one has a feeling of "security" in so doing. Let us refer to the *Electrician* to read what it says anent the commercial aspect of electric lighting. After referring to the fact that manufacturers of certain electric lighting machinery had been denied a patent, etc., our authority remarks:

"As a result of this state of affairs the public has enjoyed what has been practically an era of unrestricted competition, in both arc and incandescent lighting, for some ten years. But contrary to the general opinion, indications are by no means wanting that the present condition of things is likely to undergo a material change at no distant day. A combination or consolidation of electric lighting interests has often been discussed, and sundry attempts have been made in the past to realize it. But the combined resistance of the innumerable personal interests which would be affected by such a move has been far too great to permit real progress in the desired direction to be made. Meantime the stockholders of the electric light companies, as well as the public, have gradually become more and more disgusted with the present outlook.

"Only a very small proportion of the vast sums of money embarked in electric lighting enterprises has yielded any return whatever, and it is becoming painfully evident that the bulk of the investment must sooner or later be charged to the account of profit and loss.

"However well-founded the public antipathy to monopolies may be, it must at least be affirmed of an electric light monopoly that it is so closely hemmed in by its great rival, gas, that no fear of extortionate charges need agitate the mind of the prospective consumer."

Coming from such a source, these words have, or should carry, great weight. It is scarcely necessary to inquire into their meaning; for if they mean anything at all, they mean that gas is victor; that the electric light is its prisoner, and can only move within "circuits" prescribed by it; that the outlook for greater freedom is gloomy; that its future as an investment is unpromising; in short, that "it is hemmed in by its great rival, gas."

Now, in the face of all this (and much more might be said), we are advised to embark in electric lighting and thus unite "the twin interests." And this by our friends, not merely by those who have something to sell "in the line of electric light supplies," but by those of our own household, so to speak. We are told that to err is human, and even great men make mistakes sometimes. We all remember some years ago being advised to put in a water-gas plant, on the ground that it was "a good thing to have." Some gas companies did put in a plant, while others purchased "the right" to do so; and to day in one western State alone at least three water-gas plants are lying idle.

Shall we say, "Somebody blundered," or "was it all for the best?"

In contrast with this let us listen to the advice of one who sees things with other eyes. In a conversation with him on the topic of electric lighting and its bearings on the gas business, he said:

"Let it alone; attend to your own business. Don't fight it, it will thrive on opposition: don't buy it, it will impoverish you."

I have often thought of these words of this Michigan gas man; and observation is proving to me that he is about right. The ground I have always taken is that if anyone can make a financial success of electric lighting the gas company can. Gas companies have much within themselves that others have not, such as ground, or a building that can be utilized, refuse fuel that can be worked up, an office, with secretary, collector, etc.; but the general opinion of those companies that have adopted it seems to be that the returns are small for the money invested. Of course there are some exceptions, for some appear fairly well satisfied with it. Yet, on the contrary, there are those who say that they have made a mistake, that there is no money in it, and that they have to fall back upon the "old reliable" for their dividends.

But, says one, "It is best to control it," and thus do all the lighting. Why, then, not control coal oil, and do away with that competitor? The latter is a much more formidable competitor of gas than is the electric light—I hope Mr. Thomas Turner will not accuse me of plagiarism, as this was written *before* I read his excellent address at Toronto—it is a better light than the incandescent, and it is also "the poor man's light."

While speaking to an Illinois gas man recently, the latter said he "was not worrying about electric light, but 12 cent coal oil was spoiling his business;" and still that gentleman does not contemplate going into the business of furnishing coal oil.

(To be continued.)

Observations on Heavy Buildings.

By R. W. Gibson.

What is a heavy building? It is certainly no new thing. The world is dotted with them so freely that, in abundance of human interests, they rival the works of nature. But architecture changes as time changes. Each age has its character, which is recorded in its buildings more permanently than in anything else. The ambitious efforts of the eras of military conquest, and the monumental expressions of those of religious enthusiasm, are written clearly in the wrought stone of the old edifices which are our inheritance. And these are not undervalued. We still experience the same emotions and passions, and express them more or less ably in the same materials. We still build towers and cathedrals and tombs, and all these might come in a general way under the title of this paper.

But there is now a new order of things. This is the epoch of industrial enterprise. Let us consider for a little time this newer work we are doing. We are not in the habit of looking far into the past for guidance in the scientific department of our labors, however often we may grope there for artistic inspiration. And this is because most of what we do is new. The architects of ancient times have raised thousands of tons of marble in majestic beauty; that was their aim and object in building, and all else was subordinated to it. We are called upon to deal with equal or greater structures, with certain additional demands of utility and economy, which would have rendered the task impossible to the masters of olden times. The stately buildings of this class which tower over the streets of our modern cities are loaded with tier upon tier of spacious chambers; they are permeated with countless flues and ducts and wires, and made alive with machinery vibrating with enormous power. And with all this the walls upon which they are upheld must be pierced with innumerable windows and doors, so that the light of day

and swarms of busy workers, or luxurious residents and their attendants, may have free access, even to the basements and cellars. These tiers of floors must often support enormous loads of merchandise, or of machinery, or of human beings. And, lastly, the structural materials must not be only incombustible, but, as far as possible, fire-proof.

Under these conditions we find that our work is, in truth, of a new order of things. And in that new order ideas develop rapidly. The most daring conceptions of one generation become the commonplace thoughts of the next. Accumulated experience reduces to method all those theories which are found worthy of it by the tests of practice, and the quicker we can evolve these methods, and formulate their rules, the easier our progress and the freer our course to the next stage wherein new problems await us. Therefore one of the tendencies brought about by the need for these heavy buildings is toward mutual assistance, a careful observation of what other things are doing.

There is, undoubtedly, too little attention given to the process which may be called the analysis of contemporary art. In the earnestness of individual work there is too much isolation and independence. The man who discovers says nothing of his thought, and each one of us explores and re-discovers the same truth; and, indeed, there is a harmful impression that the rule of originality should be interpreted to debar the adoption and repetition even of a good principle; so that what is done in this direction is, to some extent, disguised and apologized for. It was not thus that the old-time heroes of our craft worked. From the time of the Pyramids down to that of the Renaissance the schools were more evident than the individuals, and whether by master or by pupil, the work shows subordination to accepted codes. From these undisputed principles individual labors toward perfection commenced at a stage higher than that at which many now terminate.

It was by this collective knowledge the Greeks carried refinement of detail to its height. And (to go from one extreme example to another) it is by the power of the same method—the acceptance and adoption of certain unoriginal but established types—that the designers and builders of the least educated class among us are enabled to erect fairly satisfactory structures of many stories and complex arrangements, such as the cheaper flat and tenement buildings of New York city. We will not overlook the imperfections of these buildings, nor will we mention them as worthy of imitation, but they do teach the lesson of co-operation and collective experience which enables work to be done by men, not one of whom, independently and originally, would be competent to do it. The diversified character of buildings of the higher order may lessen the opportunity for this evolution of their design, but it does not preclude it. There is enough of it evident to show the need for more. Much has been said and written of late, especially in Europe, about a modern style of architecture. The nearest approach to it is without doubt shown in modern American business buildings; and if the best specimens by the acknowledged leaders in our art are compared it will be seen that sometimes, unconsciously, even unwillingly, they follow more or less perfectly the same methods. Heavy buildings of this class promise to compel by their limitations a uniformity of design which almost amounts to a style. In order to discover the laws of this style, let us examine practically the circumstances in which they originate. Scientific design proceeds upon past experience by continuing or adopting successful features and avoiding known faults. What, then, are the successes and the faults in recent heavy buildings? It is understood that fire-proof buildings of many stories are more particularly referred to.

Despite all that has been learned and written upon the subject, the great difficulty of unequal settlement is the chief cause of faults. I speak of the settlement by compression of soil upon which a building stands. It is a curious fact that much of the most valuable and densely covered building land in the world is notoriously bad. Many of the heaviest buildings stand on soft, yielding soil. The lower part of New York, with quicksands, silt and mud; Boston, with its districts of made ground, where tidal water used to ebb and flow; Chicago, with its lake shore alluvium and wet sand, all furnish examples of this. Among older sites, Pisa, whose leaning tower has puzzled so many dilletanti into fanciful fiction, and Venice and Antwerp and London may be mentioned, the last including large areas of the blue clay of the Thames basin. The commercial origin of their prosperity accounts for it. Where the ships came the cities grew, and there the architects were set to work. Sometimes other causes prevail, as, for example, at Albany, where the New York State Capitol stands upon a hill of clay; but this same clay, when it lies with its natural stratification unbroken, is in the writer's experience found to be a better soil than is generally supposed.

But let us not linger upon subjects already extensively discussed. These compressible soils, it is well known, must be built upon with equalized loads. The law may be accepted as established—that each square foot of base of pier and wall must bear with an equal pressure in order to secure an equal settlement. But we may still look around us and see faults which this doctrine was to banish. This subject was chosen because of the discovery by the writer, in a series of examinations of modern buildings, of the fact that unequal settlements abound; and here are some of the reasons: We calculate the loads upon our girders, columns, walls and piers, and we say, for example, column C in a ten-story building has a base bearing three tons per superficial foot, and wall W X a base expanded to give the same pressure. Wall W X we will assume to be a side wall in a building not on a corner. The structure is finished and occupied, and the wall W X slowly and irresistibly takes its half-inch, or inch, or more of settlement, squeezing down the soft soil despite all preliminary ramming or other preparation. This we expected. But why are the floor levels disturbed, and why those little cracks in the front lintels and sills if all has settled together? It is somewhat disappointing to look about and see how many sills and lintels betray this fault of unequal settlement, by a crack close to one end—just the bearing end broken off. Inside the building the columns in several cases appear to have lifted. It has been argued that the brick and mortar was compressed in its numerous joints, while the iron, of necessity, is not perceptibly changed. This is true, but not to the extent now in question. Let us look at our calculations again. The wall is all right; so many feet, so many tons; the columns so many feet of iron; so many feet of floor, weighing, perhaps, 70 pounds per foot; so many feet of floor loads at 150 pounds per foot—here we have the error. We may say it is not an error, but anything is an error which produces bad results unexpectedly. The floor loads are not there. The mason work is on the wall base in actual fact. But the load of 150 pounds per foot is on the floors only in theory, and the column foundation, which we assume to support, say, 360 tons, has actually only 180 tons. What wonder that there is trouble. And in the front, where the girder ends rest upon the front piers, as they usually should do, the same thing occurs in a lesser degree. There is a larger proportion of mason work in the calculated load, and only one girder instead of two; but the difference here even amounts perhaps to 100 tons. What can be done? Custom, based upon knowledge, requires that each floor shall be equal to a safe load of 150 pounds per foot. In New York city the law requires this for a fire-proof office building, and further, that the columns shall be safely equal to the total of all the floors upon them at the same rate. This would seem to be unnecessary in many cases. In each floor an excessive strength is demanded to guard against contingencies, such as the movement of heavy safes, or the possible use of some floors for storage. But on all the floors together a fair average is permissible, because the average is always naturally maintained by reason of the number and variety of the different stories. The columns we may, however, accept in compliance with the law and customs. The excess is not harmful. But in the foundations we have seen that it is positively injurious. The law, recognizing the impossibility of the task, usually leaves the arrangement of this part to be done according to circumstances, except that it stipulates a minimum, applicable to good soil, which does not approach the necessities of the case under consideration.

The foundations of columns should be equalized with those of walls, upon a basis of a liberal, but not excessive, average of floor loads, say, 50 pounds or 60 pounds per foot beside the weight of the floor material. This could not possibly be surpassed in an office or apartment building. It is the weight of a crowded seated audience on every floor at once. It is an allowance of ten or twelve tons of load to an office or apartment 22 feet by 18 feet. If some floors could possibly be loaded more heavily, others would certainly carry less. Let us work according to these facts, and while we may still expect a few cracked ends of lintels, the difficulty will assuredly be lessened. It is, therefore, evident that while excessive strength is a harmless precaution in the actual structure, yet a true calculation is necessary for foundation areas.

Next, let us give some further attention to the front. There is a natural set of dimensions arising from limitations and requirements in these buildings which leads us all for some time in similar paths. The stories (excepting the first) are usually required about 11 or 12 feet high; the girders 15 or 16 feet apart, in order to use convenient spans of beams and floor arches, and the limits of the bearing of girders will be naturally 20 to 24 feet. If the building is so wide as to demand columns the girders will preferably be placed running from front to rear, because, first, the side walls and foundations with few or no openings, are in themselves extremely heavy, while the front and rear walls, with numerous windows, are lighter; and, secondly, because the homogeneous side wall is more adapted to receive the distributed floor beams, while the front and rear walls, already divided into piers and openings, are better fitted for fewer concentrated weights. The windows will be re-

quired about four or five feet wide, with piers of 3 or 4 feet between, or, perhaps, the openings rather less, and the piers or walls more, according to the purpose of the building. This agrees very well with our spacing of girders, except that two windows come to each division. And here we have the motive for the design of three-fourths of our modern heavy buildings. The two windows are combined and the pier carrying the girder increased, while the other is lessened. The heavy construction, of course, compels openings to be placed in perpendicular lines, except in the uppermost stories. So far so good; but now arises another difficulty which has been abundantly studied.

The intermediate pier is often carried up from the same foundation (usually continuous under such a front) which carries the main piers. These latter, with their enormous loads, perhaps 400 tons each, compress the soil as calculated, but the foundation, laid continuous, does not remain so. The part loaded goes down, and the part under the windows remains where it was placed, and the intermediate columns, whose comparatively little weight rest upon it, do as it does. All the way up the front is slightly distorted and lintels are cracked. When the writer first began these observations the cracks in the lintels were rather puzzling. There seemed to be in many cases no apparent cause. The fact is it takes very little unevenness to produce a crack. The force is irresistible, and the lintel is a small stone. A good precaution is to give it only so much bearing as is necessary, so that there is less of the end held in the vice-like grip. With stone resting on stone, 3 inches is enough, and many bands, sills, lintels, etc., have 8 or 9 inches running into the pier. If the building is thus more flexible it will not show these movements at such a trifling stage.

But let us go to the root of the evil. Shall we hold down that lighter portion of the continuous foundation and compel it to go altogether? And if so, how? The inverted arch is the first thing likely to be called for. It is a doubtful aid for this purpose. If used it should be of ample rise, or rather drop; and a pointed or gothic form would be best. In a wall with a good depth of masonry below it the arch is no doubt good. It does not take the whole load of its span; but down actually at the bottom, next to the concrete, an inverted arch must be loaded with about 2½ tons to the superficial foot of base. Think of this enormous load. Turn the arch the other way up and think of it. It is perhaps 6 feet wide; the base is perhaps 10. That makes it loaded with 24 tons per foot of length if considered as a bridge. The thrust is enormous. Imagine the girder necessary to do this work! If it does not do this work it will not compress the soil as it would demand of it. Suppose we lessened the load by reducing the width. Practically this almost amounts to giving up the continuity of the base crown. This will be sometimes a gain, especially if the piers are far apart. Or the great piers may have side footings which meet at the foot of the small ones, one the base course; those on the other faces being proportionately less. Then if the great piers are equalized the small ones will be carried down with them. But a flat inverted arch will do no more good than the slab of concrete or the base course of granite. Brickwork and concrete must be considered as possessing no transverse or beam strength under these loads. They will resist pressure and will spread it at an angle of about 25 degrees from the perpendicular, no more; and the batter of the offsets or the cord of each half invert should be at about this angle. There are granite bases to be seen whose offset equals their height, in which an apparent tilt upwards has resulted from the failure of the masonry to carry the pressure out at so great an angle.

But the true way to make our light intermediate piers go down with the heavy ones is to build them upon girders or arches resting upon the latter. Then even if the great piers differ in settlement, the smaller will maintain their proper intermediate position. It has been assumed that a front entirely of masonry was in question. This undoubtedly is a higher grade of architecture than that in which iron is freely used. Sometimes we see the main piers of mason-work carried up with the intermediate piers and other parts entirely of iron, each floor carrying its own tier. This is good in the main, but it misses many of the best opportunities for design, and is of necessity monotonous. Sometimes the iron features are grouped two or three stories together under arches of masonry. This is better; the stone construction is more complete and the iron subordinated to it; and, other things being equal, the use of masonry throughout will undoubtedly produce the greatest dignity of effect.

Now we have reached the point in the argument where æsthetic ideas are invited to take their place. Here are encountered the facts upon which, it is submitted, the modern style is founded; yet the constructive and the artistic are, as they should be, so closely linked that we must not attempt to consider them apart. We have traced the development of the achievement of an equal foundation; now for the superstructure. The superintendent of the New York Building Department once said (if the veracity of a New York reporter may be trusted) that "the commonest error in construction was that of making columns and piers too big above and too small below." He referred, no doubt, to the class of designers before alluded to, whose skill is perceptible only when collected into a sort of joint stock of that commodity. But the same charge in a lesser degree could be made against some buildings of the first class. An intermediate column or pier supports the lintels and the sills of the next story above, and then comes another similar column, and so on to the top.

This is all very well for two or three stories, because the smallest desirable column will be competent to that extent and because the uniform size of windows suggests equal columns; but if six or eight tiers are so raised it becomes questionable and monotonous. The single girder, too, has to be made very strong to avoid perceptible defection, as it is loaded in the center. To meet this objection, another improvement is developed. The two or three stories, for which the superimposed columns are proper, are so designed, and then a new girder is introduced, with perhaps, for variety's sake, one story entirely open immediately under it, and the intermediate columns again above. In this way we get the numerous tiers of floors and windows reduced to groups. Now we all know how certain critics of the last generation have protested against the grouping of stories, as in the Paladian style, condemning it as untruthful and unconstructive. Yet there has been an instinctive reluctance to abandon it, and we may be assured that any persistent instinctive feeling of this kind is based upon some reason, although that reason may not be readily discoverable.

In our modern construction, carried to a high degree in the differentiation of parts, we find these reasons which were not evident in lesser works. Another piece of construction, called false by some critics, is reached here too. That is, the use of an arch or stone lintel at certain levels, with a girder behind it or over it, which it is said does all the work. It is true the girder does the work of sustaining the load, and as a tension member, to tie the piers supporting it. But the arch has its duty also. It is a most effective means of holding the piers apart, resisting any tendency which they may have developed to close inward, and as it carries no weight but its own, its thrust is abundantly met by the ties and the mass of the piers, and an equilibrium of great strength is maintained. And for this same stiffening effect, as well as for æsthetic reasons, a story may be introduced in one or more places which deals with the front as a whole, not as piers and lintels, but as a wall of the full thickness with openings through it. Pleasing contrasts may be obtained by dividing certain sections into three windows instead of two, and this without any imperfection in structure. The sky line is sometimes broken by gables or dormers, and sometimes as severely horizontal as a Roman might have designed. Either method is permissible, and the authors of this style are not afraid to use the simpler motive when circumstances require. Then the lack of light where it is most needed namely, on the ground story, often prompts the placing of the first main arch or lintel over this or even over the second floor instead of at the foundation. Lastly, the monotony of the equal stories is varied by collecting them in unequal groups. Thus we arrive at the fully developed phase of a most simple and dignified composition for the front of a modern heavy building of the commercial class—which is, to sum up, a facade of many stories divided horizontally into a few main groups. These are contrasted in proportion by including one, two or three floors. The vertical elements are widely spaced continuous main piers, forming openings subdivided by small piers, discontinuously, in the different groups.

This analysis of some of the motives of modern design, and the construction from which it arises, reveals the close relationship of all the best work of this class, however varied in treatment of detail. Its truths are alike expressed in the Romanesque work which is so fast growing in favor throughout the country, in the scholarly Renaissance of New York, and in the more free arches of Chicago. The principles are the same, and the necessities and the solutions of the problem by different heads and hands have that in common which constitutes a new school of architecture, and which, with the prevalent able, strong treatment of the noble round arch, promises to establish a national style. Already it is begun, and we have a right to expect more of the future than we have received in the present.

ALBANY, Oregon, wants a gas works. This place is the capital of Linn county, is located on the east bank of the Willamette river, at a point about 28 miles south of Salem, and 81 miles southwest of Portland, and is on the line of rails operated by the Oregon and California Railroad. It is located in one of the most fertile valleys of Oregon, is bound to be an important commercial center, and contains about 4,500 souls.

The Best Means of Increasing the Demand for Gas.

[Contributed by Mr. C. F. Botley (Swindon, England) to the *Gas and Water Review*.]

This subject has of late attracted and received a considerable amount of deserved attention, being, as it is, one of great interest and importance to all connected with the gas industry in these days of very keen competition; and gas engineers should, we consider, use their best endeavors to produce their useful specialty—coal gas—as economically as possible, the price usually being against its more general adoption by the majority of the populace.

Before dealing further with the subject immediately under our notice, a few remarks with reference to the above-mentioned competition, *as affecting the demand for gas*, may be of interest to our readers.

Gas, in this country more particularly, has at the present time two important rivals worthy of careful consideration—viz., oil and electricity. The foremost, oil, owing to its remarkable cheapness principally, is by far the more formidable; Russia and America are continually sending us ever increasing supplies. (The imports of petroleum from all sources in 1887 amounted, we believe, to approximately 75,000,000 gallons.) The vast improvement in lamps made of late years has enabled oil lighting to become the first rival of gas, having indeed in some few places of minor importance supplanted gas, for a time at least, as the means of public lighting. From recent statistics, however, it would appear that in towns and districts where gas is supplied at from 3s. to 3s. 6d. per 1,000 cubic feet, oil has little or no chance of competing favorably with its rival as a mode of public lighting. The dangers also attendant upon the use of petroleum for domestic lighting are considerable; lamps are accidentally broken, or explode without apparent cause or warning, and the conflagrations thereby caused are annually increasing. The deaths of from 200 to 300 persons are every year recorded in this country alone as being due to lamp (oil) accidents, etc. In passing, we would note that fires and accidents are sometimes attributed to gas, and correctly so; but in almost every case it will be found upon investigation that the cause has been owing to some person or persons searching for an escape with a light, in spite of the fact that warnings are continually being given against this extremely foolish practice. The best consumers of oil are of necessity artisans and cottagers; but very few of these would, we think, after having had experience of the cleanliness, comfort, and comparative safety of gas, return voluntarily to their old system of lighting.

In some neighborhoods of late the obstinate and would-be coercive policies of the directorates of the respective gas companies have caused large numbers of consumers to return to the primitive method of lighting by oil, not because they preferred to do so, but simply out of hostile feelings toward the companies. This sort of thing should, we consider, be utterly condemned as being most indiscreet, and against the best interests of our gas industry. It most certainly does not tend in the right direction of increasing the demand for gas. We are aware that sometimes gas consumers are both reckless and inconsiderate in their demands, and, of course, in such instances firmness upon the part of directors is excusable, if not right.

From the other rival mentioned, electricity, the commonly supposed *bete noir* of the gas profession, there is not much at present to be feared, at least where economy of importance as a rule is a consideration. It should not, however, be in any way despised, improving, as it is sure to, in course of time; indeed, there appears to be, and without doubt is, a field for this style of illumination, and it can be used for purposes for which gas is unsuited or not applicable—such as, for instance, on board ship, where, according to the author of a paper read at the recent meeting of the British Association, "the comfort, security, and true blessedness of the electric light is experienced."

Indeed, we might almost say that electricity is a means of increasing the demand for gas, strange as it may appear. However, a well-known gentleman of the gas profession, who visited America within the last few months, recently remarked that "one of its (electricity's) functions was to so intoxicate people with the luxury of light that they went straight off to the gas company and doubled their supply of gas." We learn also from the same source that in America, where we suppose competition against coal gas is as severe as anywhere—from oil, natural gas, and electricity—the increase in the consumption of gas reported by the principal gas companies for the past year (1887) has been at the rate of 20 per cent. Due no doubt in some considerable measure to the commotion of last year, occasioned by the burning of Exeter and other theaters, electricity has been recently adopted as the mode of lighting in many of the principal London theaters and elsewhere, being, according to some people, perfectly safe as far as danger from fire is concerned. This may be true, but nevertheless we can remember recorded instances of fires where the causes have been ascribed to electricity.

Considering the very careless way in which gas is generally used in theatres and other places of amusement, it is almost surprising that disasters are not of more frequent occurrence: fires usually originate on the stage, where numbers of naked gas flames are allowed in far closer proximity to the scenes than is necessary. Gas, to use an old proverb, "is a good servant, but a bad master," and this presents a good illustration of the truth. To us it appears strange that proprietors of theatres, having any regard to economy, should adopt electricity, when for a trivial amount the dangers attending the use of gas, among the stage scenery at all events, could be removed. Protected (with wire guards) gas flames, and scenery rendered partially, if not completely, incombustible, should, we think, admit of gas being safely used.

Electricity certainly may add to the effect, or perhaps form an attraction: as to this we cannot say. However, we were pleased to hear the other day of two theatres, one in London and one in Brussels, having been most successfully illuminated with Wenham safety gas lamps; this is, without doubt, a move in the right direction.

The applications of gas are so useful, and are every year becoming more numerous, that we do not see any reason why the consumption in towns and districts supplied by enterprising and properly managed gas companies should not annually show substantial increase. As much affecting increase in the demand for gas, we will now briefly consider its varied applications.

Lighting, Public.—This, as a rule, is an item of much importance in the revenue of every gas company, which should annually increase as new districts in the respective neighborhoods are opened up. Large increases under this head can scarcely be expected, although with most local authorities at the present time improved street illumination is "the order of the day." In a comparatively speaking well-lighted town with which we are acquainted the amount received for public lighting forms about 13 per cent of the gross revenue derived from the sale of gas.

Lighting, Private.—The annual returns under this head should show satisfactory increases due to new consumers. For lighting, the consumption by existing consumers is not likely to be greatly augmented. All the new and beautiful lamps, whether "regenerative" or "incandescent," have the same important qualities of giving more light with less gas, etc.

Cooking.—There exists at the present time a large field for gas used for cooking purposes, and in this direction gas companies may, we think, look for large increases in consumption. The superiority of this mode of cooking over the ordinary one is manifest; it is cleaner, better and more economical, and the stove is, moreover, always ready for use. Those companies who now let out stoves on hire at reasonable rates find their investment to be a profitable one, no doubt, as, indeed, it should. Exhibitions of gas stoves, appliances, etc., and lectures upon the use of gas for cooking, practically illustrated, as are now held, being most useful, should be encouraged. As a rule, such lectures are well patronized, and prove of substantial benefit to the company under the auspices of which they were given. Having in mind their undoubted advantage, gas managers should, we think, arrange to have these lectures a little more frequently than they usually do.

Heating.—The consumption of gas for this purpose may be in future expected to largely increase. For constant use no doubt the present usual price of gas does not admit of its economical or extensive application as a fuel. It is useful, and can be used in some cases, however, with economy, as, for instance, in a room where a fire is not constantly required; in such a case the gas would be lighted when necessary, turned out as soon as it was done with, and thus all the labor and discomfort of a coal fire would be avoided. With cheap gas a more extensive use of it for heating purposes will no doubt be the result.

Ventilation.—Here, again, in the consumption of gas for this important purpose, we may anticipate an increase, for at present this subject is receiving much attention. At the time we write Messrs. W. Sugg & Company, of Westminster, are advertising a system of combined gas ventilation and illumination, which, according to report, is most successful and satisfactory; it is certainly an invention of much value, and what is greatly needed.

A very common example of ventilation by gas, and with which most of our readers will be familiar, is the so-called "Sunburner" to be seen in most theaters.

There is no doubt that in many cases the gas jets in rooms assist very much in ventilating them, and that the dreadful products of combustion over which some people make such a "fuss" are more useful in oxidizing suspended organic matter than destructive in their action on pictures, etc. Architects in this country up to the present time appear to

have paid but little attention to the important matter of house ventilation; let us hope that in future they will be more careful in this respect.

Motive Power.—For this purpose the consumption of gas is gradually increasing. There are many thousands of engines (gas) in this country, which fact bears witness to their efficiency; in many cases they are decidedly more economical than steam or hydraulic engines. Our opinion on the subject cannot be better expressed than in the following words of a recent writer: "Wherever there is facility for fixing a gas engine, and a workman can be spared to look after it, ordinary coal gas is a much cheaper source of power than any system worked from a central station."

Gas engines have proved extremely useful in separate electric light installations; indeed the considerable increase in the consumption of gas in Vienna recently reported is, it is said, due to the large number of installations put down during 12 months.

As another interesting and useful application of gas as a motive power, we may appropriately mention the gas hammer of Messrs. Tangye Brothers, Birmingham. All such inventions are calculated to create an increased demand for gas.

Other Purposes.—The minor applications of gas are very numerous, but it may be of interest to mention its use in the workshop for heating and other purposes, in the laboratory, where it is an almost indispensable requisite, and in a compressed form for the illumination of railway carriages, etc.

Increased consumption by existing consumers, and securing as consumers artisans and cottagers, appear to us to be favorable means of increasing the demand for gas, and for convenience we will, therefore, discuss the subject under the below-mentioned headings.

Increased Consumption by Existing Consumers.—Increases in the consumption of gas by persons already consumers must, as has been previously noted, in most cases be due to its more general use for purposes other than those of illumination, such as cooking, heating, etc., and in this direction gas companies should offer every possible encouragement, by letting out gas stoves and other appliances at low rentals, and by affording, by means of exhibitions, lectures, etc., persons the opportunity of seeing the latest improvements and inventions. As to the value of differential prices for day and night consumption, we cannot with our limited experience, give any confident opinion; but it certainly appears to us that gas at a cheaper rate during the daytime would stimulate the demand for cooking and heating purposes, and thereby, due to the increased revenue from the sale of gas, assist a company in effecting a reduction in the price of the gas. Differential prices, in our opinion, should, if adopted, prove more advantageous to companies with a comparatively high-priced gas, for to be effective the difference in price between the "night" and "day" gas would have to be considerable. There is no doubt that frequent all-round reductions in price, such as one or two large companies in London make, are most satisfactory to all concerned, and tend to augment the demand.

When gas is cheap, people are naturally not so careful as to using it freely. We have frequently heard such a remark as the following passed: "Well, although there has been a reduction of 2d. per 1,000 cubic feet in price, our gas bill is just as much as ever." After the foregoing, the explanation of like remarks is obvious. Gas companies unfortunately find it an impossibility to please everybody; however, by supplying their gas as cheaply as possible, and by affording facilities for hiring lamps, stoves, and other appliances at liberal rates, they certainly are able to give satisfaction to the majority of their consumers.

Securing as Consumers Artisans and Cottagers.—Obtaining the custom of cottagers, etc., and retaining it, is a difficult matter, which as yet has had but little practical trial. There can be but little doubt that with the mass of the populace using gas, the revenues of respective companies would be considerably augmented.

Let us consider the causes which are against artisans generally using gas. Briefly summed up, they are as follows:—(1) Initial cost and expense; (2) quarterly collections; (3) deposits; (4) meter charges; and (5) the ordinary price of gas.

(1) Initial Cost. It can be readily understood that this is a matter of supreme importance to a working-man, who, as a rule, is unable to afford the cost of fitting up his house for gas. In a large number of instances such persons would be glad to use gas if they could; it not being laid on, however, they are unable to avail themselves of its usefulness.

In respect to new houses, we would suggest some system of co-operation between the owners or builders and the gas company in respective neighborhoods. We believe that the time is yet to come when many houses erected, both large and small, will be fitted throughout with the most convenient gas appliances, including burners, stoves, fires, etc., etc.

(2) Quarterly collections are, too, matters of much importance. Small consumers would, as a rule, pay with difficulty once in every three months what if collected weekly or even fortnightly they would scarcely miss, and workingmen who live from week to week would find such accounts rendered quarterly a serious consideration. The lately invented ingenious automatic meters ought to prove useful to small consumers, but such meters are at the present time, we fancy, too expensive for general use.

(3) Deposits are required by some companies from all new consumers, but such a system, as usually conducted, does not recommend itself to us, and in the case of artisans it can readily be understood would prove most objectionable.

(4) Meter rents and charges should, in our opinion, be gradually but eventually abolished, whether in the case of a large consumer with separate meters to register consumption of gas for cooking and lighting purposes, or in the case of a small consumer with only one meter. Some time ago the gas company at Sheffield decided to fix meters free of charge, and this step has proved to be most successful. In one year during which charges were made 678 meters were fixed, but in the following year with meters fixed free, 1,777, an increase of 1,099, were put in. We recently noticed with pleasure that at Bristol the directors of the gas company voluntarily reduced the meter rents; no doubt in time they will see their way clear to abolish such altogether.

(5) The price of gas usually is only a matter of minor importance to artisans compared with the others. It is, however, to the interest of every company to retail gas as cheaply as possible.

It would appear to be wise to give consumers the option of purchasing by convenient instalments the various appliances let out "on hire" to them. After careful consideration, our conclusion is that in spite of competition there is yet a great future of prosperity for the gas industry of this country, a prosperity which will continue so long as any of that great source of England's wealth, viz., coal, shall remain. In time to come gas will be supplied at a far cheaper rate than now, and shareholders will be content with 5 per cent.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Messrs. N. Bennett, C. M. Wilson, and E. L. Cougill, of Tacoma, W. T., and S. E. and C. H. Larabie, of Montana, have incorporated the Fairhaven Land Company, capitalized in $250,000, to act in conjunction with the Fairhaven and Southern Railroad Company. The avowed objects are: The construction, operation, and maintenance of a railroad from some point on Bellingham Bay, county of Whatcom, continuing to a point on the Columbia river, Washington Territory. At the terminus the Land Company proposes to lay out a town, build water and gas works, etc. If we are conversant with this situation and its circumstances, we think the Fairhaven Company's gas works will not be constructed forthwith.

At the annual election of the Hartford (Conn.) Gas Light Company, Messrs. Hugh Harbison, Francis B. Cooley, Jas. L. Howard, Henry K. Morgan, Geo. Roberts, John P. Harbison, Atwood Collins, Nathaniel Shipman, and Rodney Dennis were chosen Directors. Messrs. Nelson Hollis and Chas. S. Goodwin were appointed Auditors. Despite the efforts of the local electricians, Treasurer Harbison did not seem to experience any great difficulty in drawing checks upon the Company's balances in the disbursement of the regular semi-annual dividend of 4 per cent.

At the annual meeting of the Dover (N. H.) Gas Light Company the following Board of Directors was elected: Governor C. E. Sawyer, E. V. Brewster, John Holland, and Amos Paul. The organization proceedings resulted in the election of Mr. Eli V. Brewster to the Presidency, Mr. Thos. B. Garland being appointed Clerk and Treasurer. The Company was fairly prosperous during the year, and in passing we would call the attention of those who insist that gas makers and gas investors are continually in receipt of enormous interest returns, to the dividend regularly paid by the Dover Company, which is at the rate of 4 per cent.

In the last annual message of the Mayor of Springfield, Mass., to the City Council, his Honor touched upon the subject of the public lighting, and referred to both systems—gas and electricity—in use. He thought the city was not receiving that which it paid for, and we must agree with him, in respect of the lighting value of the 2,000-candle power arc lamps at least. And this agreement is reached through remembering Prof. Stoddard's report, published in our last. His Honor's hint as to the inefficiency of the gas service, however, seems to spring

from a circumstance wholly without the control of the Gas Company, in that it hinges directly on the lack of public spirit shown by the Council. A moontable is followed, strange to say; and we may be forgiven for suggesting that this beautiful city of the Bay State ought not to be placed in dependence upon those atmospheric freaks which veil the moon when the latter is supposed to be in orbit with unclouded face. Of course gas is ineffective as an illuminator when it is shut in by the burner cocks, and we are pleased to note that his Honor appreciates in some degree the force of this objection; for he strongly recommends the Council "to consider the question of burning all street lamps all night."

PITTSBURG, PA., is in a state of mind over the incandescent system of lighting the local court house, as now performed by the United States Electric Light Company, which corporation secured the contract by under-bidding the Westinghouse and Edison Companies. Now that the system seems to be a failure the disgruntled bidders are pointing with pride to the doleful fact, and their chorus of "Didn't I tell you so" is loud and long continued. Perhaps it would be in order to print the following, fron the *Despatch*, of the 9th inst., in connection with this affair. Our authority says: "If the work of the lamps be the best the United States Company can perform, the detractors have certainly won their case; for half a dozen of the burners do not give as much illumination as one should. Commissioners McWilliams and Mercer were spoken to yesterday regarding the matter, and they did not seem prepared to deliver an *ex cathedra* opinion. They stated it was possible, and they seemed to think probable, that the wires were so grounded that the greater part of the current was wasted, and that the trouble might be remedied. In the various departments the opinion was expressed that the fitful kerosene lamp would be an immense improvement. The matter will be overhauled ere long, and the nature, cause and cure of the trouble be investigated and remedied, as something must be done, or the Court House habitues will soon resemble a spectacle-bestridden school of German savants,." To this, we might add, that having recently passed through the Pennsylvania Depot at Pittsburgh, at an hour and time requiring the employment of the entire resources for the artificial illumination of that huge structure, we were strongly impressed with the inadequacy and incompleteness of the service of the incandescent electric lamps, which defects are not to be charged to a seeming lack of the latter in either numbers or appropriateness of placing.

AT the annual election for officers in the Williamsport (Pa.) Gas Company—the meeting having been held in the office of the company No. 250 Pine street—the following result was reached: President, Hon. Joseph M. Gazzam; Secretary, Treasurer and Superintendent, Mr. C. A. Byers; Asst. Supt., M. J. Winters; Solicitor, John G. Reading, Jr.; Collector, Jas. Calvert; Directors, Hons. Jos. M. Gazzam, R. J. C. Walker, and Robt. P. Allen, and Messrs. J. G. Reading, B. C. Bowman, H Mudge and J. G. Reading, Jr.

WM. E. FORBES, a lamp trimmer in the employ of the Brush Electric Company, Detroit, Mich., was instantly killed by an electric current passing through a lamp, in the drug store of Dr. Walker, at Woodward avenue and Sibley st., Detroit. Deceased, who had been an expert electrician, was renewing the carbons in the lamp. Supt. Fitzgerald says that Forbes must have neglected "to close the current at the ceiling before he commenced to trim the lamp." It is said that Forbes was the sixth employe of the company to meet death through its wires during the past three years.

MR. JAS. FERRIER, formerly an assistant under direction of Mr. Somerville. at Indianapolis, Ind., has been appointed Superintendent of the Eufaula (Ala.) Gas Company, vice J. M. Scott. Mr. F. is a clever, capable man.

A. H. BARRET, of the Louisville (Ky.) Gas Company, does not say much, but somehow or another he manages to keep up pretty close to the leaders. On New Year's day his company announced its intention of presenting its customers with a gift in the shape of cheaper gas for illumination, the reduction being equivalent to about 8½ per cent. on the net rate. The hitherto ruling net rate was $1.42½ cents per thousand cubic feet, and the present one has been adjusted at $1.30 cents. Further than this, Mr. Barret, after many months of patient investigation and thorough study, seems to see his way clear to furnish a fuel gas for 50 cents per thousand. We are not advised of the exact plan which he proposes to pursue in this respect, but incline to the view that a non-carburetted water gas, manufactured under the Lowe system, but modified by plans originating with Mr. Barret, will be the practice instituted. So, after all, it may be that the remnants of the plant erected some years ago under the auspices of Messrs. Chess, Carley & Co., for revenue only, shall at last serve a useful purpose; for we presume that this plant, which in time became the property of the Louisville Gas Company, by purchase, will be devoted to the purpose of a fuel gas station. This full compliance with the clauses of the act under which the Louisville Gas Company now exists, is respectfully referred to Col. Cowan and his band of agitators, whose mouthings of a year or more ago would have seemed comical were it not for the venom that underlaid them. In connection with gas affairs at this point we might also say that Messrs. Morris, Tasker & Co., of Phila., are now at work on a pipe line (8 inches diameter) intended to convey natural gas to Louisville, from a point in Meade county, about 35 miles away. The Rock City Gas Company is engaged in the experiment, which seems not to be one of sufficent magnitude to have any great effect on Mr. Barret's proposition to engage in the manufacture and distribution of a fuel gas.

ERSKINE D. SMITH, having completed and turned over to the city of Philadelphia, Pa., and to the contractors for the iron work—Messrs. Morris, Tasker & Company, who accepted it as satisfactory—a tank for a telescopic holder, at the Twenty-Fifth Ward works, thought he ought to be paid in full for his work. Director Wagner, under the terms of the contract, withheld a certain percentage ($4,420.75) of the entire payment, the balance to be paid when the holder shall have been finished and in operation, and the Director naturally refused to listen to contractor Smith's claim. The latter thereupon instituted suit; but we imagine he will have to be satisfied with what is nominated in the bond. Gas men throughout the country are likely to have an eye on contractor Smith, should he appear in their respective cities or towns looking for a chance to secure a contract.

AT the annual meeting of the Dedham and Hyde Park (Mass.) Gas and Electric Light Company, held in Boston, on January 10, the following officers were chosen: President, J. W. Clark; Treasurer and Clerk, C. A. Taft; Directors, J. W. Clark, Chas. Van Brunt, Gustav Stellwag and W. Eliot Fette.

THE reduced gas rate at Dallas City, Texas, takes remarkably well. A brother gas man suggests that Supt. Enfield ought to establish a plant for the manufacture of gas meters!

WE regret to report that Mr. Jno. M. Hill, who for 35 years had acted as Treasurer and Agent of the Concord (N. H.) Gas Light Company, has handed in his resignation. Ill health was the cause of this action. It is our sincere hope that Mr. Hill shall be spared for many a year, for he is an example of all that is loyal and consistent in belief and practice.

MR. SCRIVER, of the Montreal Gas Company, will follow the example set by Mr. Pearson, of Toronto, in that his Company has authorized him to contract in England for the supply of materials for the scheme of enlargement contemplated at the Montreal gas works. We are surprised, however, to learn that Mr. Scriver, during his visit to England, will negotiate for the services of a "competent" gas engineer. Could the Company not have secured such a person in the United States; or even nearer home, in Canada itself? We know of many a man in the States, and in Canada, too, who would fill the bill completely.

THE Attorney-General has decided that an order for the discontinuance of the charter (issued in 1874) granted to the incorporators of the Equity Gas Light Company shall be registered. The Company was incorporated by A. H. Dailey, Adolph Baker, Jno. R. Jurgens, Fred. Cocheu, H. Hamilton, and others, seemed disposed to hold the State consent merely for the purpose of speculation. They certainly never made an attempt to embark practically in the manufacture of illuminating gas.

HERE is the text of a bill that the Ohio House of Representatives has given its sanction to—still, that does not mean much in the way of accomplished legislation: "Sec. 2,479.—In case the Council fixes the minimum price at which it requires any company to furnish gas to the citizens or public buildings, or for the purpose of lighting the streets, alleys, avenues, wharves, landing places and public grounds, for a period not exceeding 10 years, and if the company assents thereto, by written acceptance, filed in the office of the clerk of the corporation, it shall not be lawful for the Council to require such company to furnish gas at a less price during the period of time agreed on, not exceeding 10 years, as aforesaid; provided, further, that in case such company refuses to agree upon such price for gas, then the Council shall by ordinance fix such price for gas for the above purposes, and said ordinance shall be binding

upon such company." This last provision looks to a most unequal settlement.

THE Toraya Gas Company, Phila., Pa., writing under date of 10th inst., says: "We noticed a paragraph in your issue of the 7th inst., wherein it is stated that Messrs. Widener and Elkins are contemplating the use of our patents"—the Toraya improved gas (from wood) process. "This is entirely erroneous, as we have no connection with the above-named gentlemen, nor with any other concern."

MR. FEENEY has introduced a bill in the New Jersey House of Assembly which seeks to regulate the price of gas in all New Jersey *cities* at the uniform rate of $1.50 per 1,000 cubic feet. The bill, which is indexed as No. 15, was referred to the Committee on Municipal Corporations.

THE members of the Chicago Councilmanic Committee on Gas are attempting to pass an ordinance whereby the net gas rate is to be placed at $1 per 1,000, "all around," as they say—*i. e.*, to both city and citizens.

SOME time ago we noted that Alexandria (Va.) contracted with certain Philadelphia parties for an addition to the manufacturing facilities of the municipal gas works in the shape of a patented oil-gas process. The contractors promised to accomplish certain results, under certain penalties, and the people are greatly dissatisfied with the outcome. In fact, numbers of the consumers finally appealed to the Council for relief, asserting in their petition that if the experimental process was continued they would no longer use the gas. A compromise was effected by the distribution of a product consisting of two-thirds coal-gas and one-third oil-gas, which still remains unsatisfactory to the people. The real trouble about the Alexandria plant is, we think, properly traced by a correspondent, who asserts that Alexandria is now suffering in this respect simply because "the works had been so completely run down through the imbecile plan of employing the moneys hitherto earned by the gas plant in paying for the ordinary expenses of the city government." In other words, the city cannot have its cake and eat it.

ACCORDING to the annual report of the Rochester (N. Y.) Gas Light Company, the capital stock stands at $700,000, of which six-sevenths has been paid in. The existing indebtedness is but $3,300.

THE Ellenville (N. Y.) gas plant has been sold to H. V. Hilliard, of this city; consideration, $20,000.

DIRECTOR WAGNER is trying to account for the present extraordinary demand for gas in the Quaker City, the consumption for the week ending January 8th having been fully equal to that which embraced the two holidays. A stack of benches that had been cooled at the Ninth Ward works on the day following Christmas, has since been refired, and is now at work. The Director reports that December, 1888, shows an increase in gas consumption of 12,600,000 cubic feet over that sent out in December, 1887; and this increased output cost the corporation just $1,680 less than did the output of 1887. Does this great monthly gain pay sufficient interest on the moneys invested in the last two years on bettering the condition of the manufacturing, storage and distributing plants of the Philadelphia works? Well, it is quite easy for the individual to satisfy himself, when the remark is made that gas retails in Philadelphia at $1.50 per 1,000. On the whole, we think it was about the best investment that Philadelphia ever made; and we further believe that her rulers might do well to take another and even larger stride in the same direction.

THE American Watch Company, Waltham, Mass., has installed a fuel gas plant of the Loomis type, and a partial test thereof was made on the 8th inst. Our correspondent, in noting the initial attempt, which resulted in fair satisfaction, considering the incompleted state of the apparatus, says: "The plant consists of 3 'converters,' so constructed that they may be used singly or together. The generator is a cylinder of boiler iron, 9 ft. in diameter and 12 ft. in height, the fire-brick lining reducing the diameter of the fire pot to 6 ft. Into this generator coal is fed by suitable provision from above. Connected with the generator is a small engine to operate the exhauster. Some coal being fed into the generator, the exhaust is started and the fuel is ignited at the top of the mass. The exhaust draft soon kindles the mass, to which additional raw coal is added until the generator is about two-thirds filled. The first products of combustion are passed off, but on the emission of producer gas the latter is diverted to the boiler grates. When, by the proper admission of steam, provision for the feeding of which to the generator is suitably made, it is desired to make water gas, one generator can be relegated to the sole manufacture of the producer variety, for keeping up steam, etc., while the other two can be used for the water gas, to be subsequently enriched in the ordinary way for illuminating purposes in the factory, whose gas bills are said to average $1,200 per month. The Company proposes to build a holder for the storage of the illuminating gas, and expects to fire all its boilers by the aid of direct application of the generator gas. Master Mechanic Marsh, of the Watch Company, admits that the first cost of the apparatus looks great, but he believes that in four years' time it shall have paid for itself in the economy effected over the present methods. Now, this experiment will be closely watched, for the American Watch Company is governed by sensible business men; but I beg leave to state, in behalf of myself, that I think in four years' time the Watch Company, in so far as the illuminating gas part of the affair is concerned, will again be paying the local gas company for its supply. It does not follow that because a corporation can and does make a good watch, that it also can make a good, cheap and safe article of illuminating gas. Watch making and gas making have nothing in common, and the cobbler who sticks to the study of his last is the one whose shoes are most in demand. —HADDAM."

THE New Bedford (Mass.) Gas Light Company has declared a semi-annual dividend of 2 per cent., and has also ordered an additional dynamo, to have a capacity of 1,500 incandescent lamps. With the latter in place the Company can supply 4,000 incandescents.

AT the annal election of Directors in the Brooklyn (N. Y.) Gas Light Company, the following gentlemen were chosen to serve: Henry D. Polhemus, Henry K. Sheldon, Alexander M. White, Jas. H. Arminton, Henry H. Rogers, E. H. R. Lyman, Chas. E. Bill, Jr., Frank Lyman and Alexander E. Orr. The changes from the Board of 1888 are: A. E. Orr, who replaces the late Mr. Jas. How, and Frank Lyman, who succeeds the late Mr. Chas. E. Bill, Sr.

MESSRS. Henry Pratt & Co., Chicago, are busily engaged in getting out a new set of their improved gas apparatus, which also includes condenser, boiler, engine, blower and connections, for the Paris (Ills.) Gas Light Company. The contractors have agreed to finish their task by March 1st. The new installation is to replace the Paris Company's coal benches and its present fuel gas plant.

ABOUT the most complete plant in this vicinity devoted solely to the manufacture of lime from oyster shells is that owned and operated by Mr. Chas. F. McKenna, at Edgewater, Bergen county, N. J. We may in a later issue describe it fully.

THE annual meeting of the Washington Ammonia and Chemical Company was held in New York, on the 15th inst. No change was made in the executive management, which is as follows: President, Geo. Shepard Page; Treasurer, Geo. G. Porter; Secretary, Chas. W. Isbell; General Manager, B. P. Clapp. This company has extensive works at Bayonne, N. J., and at Washington, D. C.

THE Mayor of Lockport, in conjunction with Messrs. Rogers, Richmond and Morgan, will make (in fact they are making) a sort of junketing tour of New York State, the inciting or ostenible cause being an eager desire to find out all about the prices charged for public electric service at various points in the State. We would respectfully urge upon the voyagers the value of a visit to Brooklyn where they will find much to interest them in the matter under consideration. If they had the good fortune to discover Mr. Anthony Barrett, of the Brooklyn electric lighting combination on some morning that had not been preceded by a lengthy session of his at the Constitution Club, that celebrity would quite likely entertain them highly, even if he did not edify them.

PROVIDENCE (R. I.) at the close of the year 1888, was maintaining a total of 247 arc lights, which at the rate paid (50 cents each per night, for all night duty during the year) entailed a charge on the treasury of $45,077.50. The Mayor, in his inaugural address to the Council, recommends that "in meeting the requests of the citizens for an extension of the electric system upon the main thoroughfares due regard to economy in the expenditures for that purpose should be maintained." In other words, that arc lighting is an expensive affair.

THE electric lighting trust at St. Louis, Mo., to include the Thomson-Houston, Brush and Metropolitan Electric Light Companies and the West Electric Light Association, may be taken as an assured fact. It was asserted that the Thomson-Houston branch would have virtual control, but this idea is valueless, from the fact that the stock is to be pooled. The Thomson Houston people, however, seem to have forced the issue.

SEVERAL bids were received by the authorities of Salt Lake City in response to their invitation for a competition in the furnishing of gas fixtures for the local City Hall building. Mr. W. W. Funge, of Salt Lake City, secured the award, at a figure close to $1,100.

WE are informed that Mr. J. Howard Manchester, General Manager of the Willimantic (Conn.) Gas Company, has decided to abandon the manufacture of oil gas at that point. The plan under consideration involves the building of new works, and we congratulate Mr. Manchester, and the people of Willimantic as well, upon the decision.

A QUEER suit is reported from Baltimore, Md. It seems that in the summer of 1887 the officials of the Consolidated Gas Company were advised that surreptitious connections had been made with their mains, and an investigation proved this to be true. Among those implicated was a Mr. Spielmeyer, who was notified to appear at the Company's office. On his arrival there he was confronted by L. R. Smoot, Secretary of the Company, who, it is alleged (and we have much doubt about it; for the Secretary is nothing if not a gentleman and a keen, shrewd business man), said to Spielmeyer, in the presence of several others, "Something is coming to you to put you in the penitentiary. You have been stealing gas from us. You had a false connection which led into your house from our main pipe, and we have the proof of it." Whether or not this language was used, the Company laid its evidence before the authorities, who were so affected by it that Spielmeyer was indicted, being subsequently tried for the offense (Jan. 1888, term of the Criminal Court), and acquitted. He now brings suit in the City Court for defamation of character, and prays that the Consolidated Company be ordered to pay him $20,000, as a plaster for his wounded feelings. In view of the fact that Spielmeyer was indicted, after a presumably close sifting of the evidence presented by the Company, we fail to see how he can obtain, at best, more than the time-honored "six cents" relief.

MR. F. TETTENBORN, writing to the Cincinnati *Commercial Gazette*, suggests that the gas stove dealers of that city ought to "hire a hall and let the public see for themselves this remarkable heat giving power in the full tide of successful experiment." The writer—and he might have cut off his sentence at the end of the second syllable in its second word from the last—evidently forgets that the Cincinnati Gas Light and Coke Company has for years not only been hiring halls, but has also employed the very best talent obtainable in the line of professors of the art *culinaire*, in the very praiseworthy attempt to introduce the advantages of heating and cooking by gas to the attention of the people. Still it is a hopeful sign when "one of the people" gives voice to such a suggestion; and that Mr. Tettenborn is honest in the matter is proven by a further remark of his to the effect that he "will be glad to advance this happy suggestion, as an individual helper, and employ an expert to be constantly in the hall to show the citizens the value and worth of this truly indispensible requisite (gas) to the comfort and convenience of all housekeepers." Mr. T. speaks from experience, as he uses both heaters and cookers at his place of business and in his household.

SPEAKING of this reminds us of having recently met a Mr. Britton, who is largely interested in the Texan cattle trade, and whose duties frequently call him to the city of Fort Worth. In conversing on gas matters, Mr. B. said that he had frequently used a gas heater in his rooms at Houston—say, for an hou. or two in the morning, when the Texas "northers" intrude their cutting presence—and for perhaps three or four hours in the evening, when disposed to read, or to adjust his books, etc., and that although the cost of the service was rather high* (he had paid as much as $8 per month on this account), he would not be without his heater were the cost of its effect twice as great.

MASON CITY (Iowa) having partially bound itself to establish an electric lighting plant, because of overtures made to certain electrical promoters, is now directing its attention to the possibilities involved in gas lighting. We are sorry, however, that the initial step is to be taken in respect of an examination of the Fahnehjelm system and process; but we presume that the committee (composed of Mayor Hughes and ex-Mayor Dennison) will take the statement that the Fahnehjelm gas can be turned in at Mason City, at the point of consumption, for from 8 to 12 cents per 1,000 cubic feet, with a liberal allowance of salt. In any event, the investigation may prove that other systems of gas manufacture and consumption will be found equal to the task of supplying Mason City with an undeniably staple article of artificial light.

* We believe the ordinary gas rate at Forth Worth is $3.25 per 1,000, but are not positive.

THE Portland (Oregon) Gas Light Company employs 18 men, and its output for the year was about 75,000,000 cubic feet.

THE authorities of Lynn, Mass., have awarded a contract for the public lighting to the Lynn Gas and Electric Lighting Company. The lamps are to be extinguished at 1 A.M., and the service is to be paid for at the rate of 46 cents per lamp per night. Mr. Prichard is evidently yet at the helm, although we have not had any signs from him of late.

TERRE HAUTE, Ind., has awarded a contract for her public lighting to the local electricians. The rate ($70 per annum, on a partial moontable schedule) will save the city $4,000 over the bulk sum paid last year to the same company for a similar service. The bid submitted by the Terre Haute Gas Company was nearly $7,000 in total below the bid accepted; and there can be no doubt that the electric company "felt the grind." Some folks in that vicinity seem to think this straw is the one that will cause the shareholders in the electric enterprise to cease to even think about dividends.

THE charter of the Louisville (Ky.) Gas Company, granted at the 1888 session of the Kentucky Legislature, provided that a gas inspector for the city should be nominated by the Mayor and confirmed by the Council during January, 1889. The incumbent is to hold office for three years, and as the annual salary is something like $3,000, the political sharks in Kentucky's big city laid many wires in the attempt to snare the prize for one of the faithful. Whether or not the faithful were all disappointed is beyond our ken, and all that remains for us to say is that Mayor Jacob nominated "Phil" B. Bate to the place, and the General Council acquiesced in the situation.

THE County Attorney for Memphis, Tenn., has been instructed to draw up a contract between the city and the Equitable Gas Light Company for the supply of gas to the public buildings, the Company's offer to furnish the same for $1.75 per thousand having been accepted.

ON the 9th inst. Director Wagner ordered that the price of coke be reduced from 7 to 6 cents per bushel, in the yards of the Philadelphia Municipal Gas Works. These works, in common with others located in the so-called temperate zones of the United States, experience difficulty in disposing of their surplus coke because of the remarkably mild winter season that has so far been their portion.

THE decline in public favor of incandescent electric lighting in Chicago is absolutely more marked than was its rise, which was rapid enough to please even the most sanguine electrician. The lamps are being ordered discontinued simply because the unbarbed filament cannot compete successfully with cheap gas; and even prodigal Chicago sometimes stops to count the cost.

THE Directors of the Chattanooga (Tenn.) Gas Company now know what it is to lose the services of a capable Superintendent, Mr. J. T. Lynn, who formerly served them in that capacity, having (as previously noted in the JOURNAL) resigned to accept a responsible position in the gas business in another city. Men of Lynn's capacity are not to be obtained off hand, and the Chattanooga Company seems to have discovered this fact; for although the directors have more than once discussed the choice of a successor to Mr. Lynn, they have not yet been able to decide as to who they shall employ.

AT the annual meeting of the Peoples Gas Light Company, Cleveland, Ohio, Messrs. George H. Warmington, Belden Seymour, M. A. Hanna, Chas. McNeill and R. R. Rhodes were elected Directors.

THE people of Lincoln (Neb.) are inquiring of the local authority why it is that the city allows the contractor for the gasoline lamps, located on streets beyond the range of the Gas Company's mains, to light the same at 3:30 P. M., when the fluid reservoirs are calculated to be exhausted in from 5 to 6 hours. Lighting at the hour mentioned may be an attempt on the contractor's part to compete with the sun; for a Nebraska contractor is liable to claim almost anything.

THE electric light plant of the Newport (Ky.) Light Company was put in duty on the 10th inst.

GALVESTON, Texas, complains that the local Gas Company charges altogether too much for illuminating the dial of the City Hall clock. If the figures given by our informant are correct (he says the lighting cost $52.65 for the month of December) they do seem rather high. Perhaps our authority charged a portion of the account for lighting other portions of the building to the clock account. Is this not so, Brother Beck?

One sad, indirect result of the holder explosion in Brooklyn on the 9th inst. was the death of an infant (Henrietta Broderick), whose parents resided in the tenement No. 37 Fifth street, directly opposite one of the dismantled holders. Mrs. Broderick, becoming thoroughly dazed from the explosion and its results, seized her sleeping child and rushed out into the street. For hours she wandered about in an aimless way, and exposure to the drenching rain so weakened the infant as to cause its death.

Mr. Townsend has introduced in the Ohio Legislature a measure intended to permit gas companies "to erect and control electric light plants. and to vest such owners with all privileges and franchises necessary for their operation." Senator Rathbone is violently opposed to the measure.

Another case of gas stealing is reported, this time from Detroit, Mich., one John Maloney, residing at 158 Woodbridge street, having been arrested on this charge by local detectives. It is claimed that about a year ago Maloney ordered out his gas meter, and then made connection between the Company's main and his house pipes. The Gas Company puts the value of the gas used in the year by Maloney at $40.

At the annual meeting of the Batavia (N. Y.) Gas Light Company the following officers were chosen: President, Wilber Smith; Secretary and Treasurer, A. N. Cowdin; Superintendent, Wm. M. Tompkins. Directors, Wilber Smith, G. B. Worthington, H. U. Howard, D. W. Tomlinson, A. N. Cowdin, H. T. Miller and C. H. Dolbeer.

Public Lighting, Galveston, Texas.

The following are the bids submitted to the city of Galveston in response to that corporation's appeal for proposals for the establishment of a municipal lighting plant. Of course the bid of the Galveston Gas Company was submitted in the usual way, in respect to an annual contract for performing the city lighting:

Galveston Gas Company: Gas for street lamps, not less than 200 lamps, $24 per annum per lamp, including lighting, cleaning and repairing of lamps. For public buildings, $2.25 per 1,000 cubic feet.

Miller & Tyson, Wilson. N. C., propose to establish an equip an electric light plant of the Waterhouse system, with all necessary apparatus, lights 8½ ampere current, 1,700-candle power each, all first-class material and workmanship, for $42,408.81; one-fourth to be paid on receipt of material; one-fourth more at the expiration of thirty days, and the balance sixty days after the acceptance of the plant; the plant to embrace five dynamos and 200 arc lamps.

The Edison Electric Light Company, 16 and 18 Broad street, New York, proposes to furnish an Edison plant with a dynamo capacity of 1,200 lights of 20-candle power each, and wire the streets with insulated wire for 1,000 incandescent lights of 20-candle power each; will furnish 500 street fixtures, the lights to be distributed at intersections of streets and in city institutions and buildings within district outlined on map, extra wire to be paid for at cost of material, the plant thoroughly equipped with all the necessary machinery, etc., for the sum of $27,000, 25 per cent. to be paid when plant is shipped, balance twelve months after starting the plant, secured by promissory note at 8 per cent.

Brush Electric Light Company, Galveston, arc lights of 2,000-candle power, as many as required, distributed as the city may select, run on the moonlight schedule at $120 per light per annum, or run all night for $130 per light per annum; incandescent lights, to be located as the city may direct, 16-candle power, moonlight schedule, $24 per light per annum; all night, $26; 25-candle power on moonlight schedule, $28 per light per annum; all night, $30. Light all city buildings and offices with 16-candle power lamps at 1 cent per lamp per hour.

Frank S. Marr, electric light contractor, Pittsburg, Pa., three different propositions: First: 150 or more arc lights, 2,000-candle power, all night, $125 per year total; 1,700-candle power, all night, $117 per year total; 2,000-candle power, moonlight schedule, $115 per year total; 1,700-candle power, moonlight schedule, $109.50 per year total; 500 or more 25-candle power incandescent lights: 25-candle power, all night, $30 per year total; 25-candle power, moonlight schedule, $27.50 per year total. Incandescent lamps for public buildings of any candle power desired, to burn at any time desired, measured by meter, price per 1,000 ampere hours, which is equivalent to one 16-candle lamp burning 1,000 hours, or 1,000 16-candle power lamps burning one hour, $9. This bid is based upcontractor establishing and operating his own plant.

Another proposition from Frank S. Marr is to furnish an electric light plant to the city, consisting of two A. C. Westinghouse dynamos, 750 16-candle power lamps each; two A. C. exciters, together with all the necessary indicating, regulating and safety devices, station switches etc., crosstrees for 500 sixteen-candle power lamps; special crosstrees for 588 25-candle power street lamps; station thoroughly equipped with all necessary machinery, etc., for $44,474.

Another bid of Frank S. Marr is to furnish a plant consisting of 1 A. C. Dynamo, 500 sixteen-candle power lamps; 4 arc dynamos, with forty 1,700-candle power lamps; one A. C. exciter, with all necessary equipment, machinery, etc.; incandescent lamps to be placed in public buildings, and arc lamps at intersections of streets; all machinery, material and workmanship to be of the best character, for $47,973.24; the total expense of operating plant, including coal, oil waste, carbons, lamp breakage, repairs to lamps and machinery, labor and salaries, not to exceed a total per month of $1,700, and should not be more than $1,200.

David Hall, of Galveston, representing the Western Electric Company, of Chicago, proposes to furnish a complete plant of a capacity of 200 arc lights of 2,000-candle power each, including two high-speed engines of 125-horse power each, and maintain and operate 175 arc lights suspended over the middle of the street intersections all night, every night, together with a sufficient number of incandescent lights to light the public buildings, the entire plant to become immediately the property of the city upon their agreement to pay $1,240 per month for a period of 60 consecutive months, or $1,364 for 48 months, or $1,556 per month for a period of 36 months. The payments named to cover the entire cost of the plant and the expense of maintenance and operation.

The committee was to make its report upon these bids to the Council meeting, Monday, Jan. 14.

The bid of Mr. David Hall for furnishing an independent outfit is about the only one conforming to the terms of the advertisement as to payment, the advertisement stipulating that payments shall be made in five yearly installments. Most of the other bidders specify their own terms for receiving payment.

Sulphate of Ammonia and Gas Lime.

The *Indiana Farmer*, in referring to this subject, says: The gas works in this city (Indianapolis) has for a few years past been manufacturing a by-product that is of great value to the agriculturist, but which few of our readers are aware of. It is called sulphate of ammonia, and is obtained by distilling certain gases arising from the coal in the coking process. The substance, when condensed into a solid and ready for use in making commercial fertilizers, is white as salt, rather light and porous, and consists of sulphuric acid and ammonia in the proportions of three of the former to one of the latter. It is sent to Baltimore and there combined with phosphates, when it becomes a first class fertilizer for some soils, worth $30 to $40 per ton. The sulphuric acid in this coal product unites with the bones or shells, dissolving them and forming a compound that has an affinity for the ammonia, thus combining a number of the most valuable ingredients in plant food. Heretofore this product of the gas works has been cast out as useless, but, at the suggestion of Mr. James Somerville, the present Superintendent, has been utilized and made very profitable to the company. The gas lime,* however, is still carted away as entirely useless, and has accumulated to the amount of thousands of tons at the dumping grounds near the river. In the old countries the farmers make use of gas lime by piling it up and exposing to the air for a year or so till the sulphurous gas has escaped. It is then spread upon the land, and is said to be very beneficial to hard cloddy soils, loosening them and rendering them mellow and productive. It would be well for some of our farmers who have tough clay soil to experiment with this material. It can be had free, for the hauling, in unlimited quantities.

*This, however, is not the case in all sections of the country, although we can quite well understand why the rich farming lands of the West (comparatively new as yet, so-to-speak) do not require an artificial fertilizer. In the East, where the soil must be coaxed to yield a fair crop, gas lime has frequently figured as a factor in agriculture. In connection with this we would recall the remarks, made by Mr. D. W. Crafts, of Northampton, Mass., at the 1886 meeting of the New England Association of Gas Engineers. Mr. Crafts then said: Some two or three years ago I spoke about getting 6 cents a bushel for our refuse lime, and this we have done for a great many years. Neighboring gas men asked me if I could dispose of theirs, and I did sell quite a quantity of it for the Springfield Company. Some farmers who have used that lime for 20 years are using it to-day, and with good success. Other farmers in the vicinity, thinking they must get similar results, applied to one man who had succeeded in bringing up some old, worn-out pasturing lands (actually at one time covered with moss) for a few hundred bushels to spread over certain pieces of ground owned by them in close proximity to his. They failed utterly. Both parties to the experiment called upon me, reported their doings, and asked for an explanation. In response to a suggestion of mine the authorities of the Amherst Agricultural College analyzed the two soils with the following result: The soil which had been benefited by the lime application proved to be lacking in limey constituents, while in the other instance the soil carried plenty of lime. Hence the success and failure of the respective experiments. Having spoken of this at a previous meeting, I thought that I would state the result of the Amherst analysis.—Ed.

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MONDAY, JAN. 21, 1889.

Kerosene Lighting Viewed Practically.

"M. K. D.", writing to the *Ledger* on this subject says :

There are such pretty lamps in the shops, and as gas is a heavy item, you determine to have it turned off and to use kerosene instead, a decision which you act upon at once. Providing yourself with a lamp with a round shade, and a lamp with an inverted shade, two or three common lamps, a swinging lantern for the hall, and a splendid ruby colored bronze beauty for the sacred best parlor, you say to your spouse, as you triumphantly indicate the comparatively inexpensive brilliancy of your dining-room with a wave of your right hand : "Now, my dear, we will have no more grumbling over the dreadful gas bill."

But he, who has just come in out of the fresh air, looks a little dubious, and remarks : "Isn't there a little smell? Don't you think you'd better open the window a moment?"

You do not notice any smell. But, to oblige George, you open the window. Instantly the flame of the lamp increases to a tremendous volume, and the chimney snaps with a loud crack. After uttering the proper shrieks, you have sense enough to shut the window and turn the flame down and out. Then another chimney is brought—there are always extra ones at first—and you decide that, not being used to it, you turned the wick too high. You begin with a gentle flame and slowly turn it higher, when crack goes the chimney again. This time you feel as though the lamp were bewitched ; but the matter is explained by the fact that Nora, with her usual brilliancy, has "jist rinsed the chimney in ice water" before bringing it in. A third chimney is brought in, and this one survives.

After you have picked the bits of glass out of the butter, and found one in the milk pitcher, and cut your fingers, and lost your temper, you sit down to dinner, when suddenly howls proceed from the kitchen. You make a sudden rush to the spot.

"It's the lamp, mum," cries Nora, from behind the clothes-horse. "It's goin' off blue, like sky rockets!" It certainly is ; and that special lamp always does "go off blue" whenever you light it, and you never can discover the mystery of its conduct. The tradesman of whom you bought it informs you that "there is no depending on cheap lamps."

The ruby lamp in the parlor is "lovely," your friends say. But the image of Love in clay, who holds the hall lantern, has a habit of letting that triumph drop, for there is no keeping his hook in ordinary plaster, and it is only blind luck that has saved you from a tragedy.

In course of time you find yourself obliged to reserve a cupboard for disabled lamps, amongst them stands the lovely ruby shaded darling. Nora was bringing it down stairs to fill, "and the way of it was that it slipped." Of course you bought another, a little more expensive—every new lamp is a little more expensive.

You used to pride pourself on the sweetness and freshness of your house. Alas! the involuntary ejaculation of everyone who opens the door of your house nowadays, after it is well lit up, is "phew!" Strangers always say, 'So, cold outside, you know." But you are well aware that when the family give vent to the same ejaculation, they always add, "Oh! that kerosene."

Finally you sit down one evening and take a sheet of paper and a black lead pencil, and try to make yourself happy by finding out just what you have saved by using kerosene, and the result is, that you send to the gas house in haste the next day, requesting to be supplied at once with a meter, and present your stock of lamps to an unfortunate relative who lives in the country, and is obliged, in consequence, to use kerosene.

Preserving Exposed Iron Work.

Mr. Jno. Heald, who has been for years identified with the extensive machine works, at Crockett, Contra Costa County, Cal., and who is also well known from his connection in a practical way with the gas industry of the Pacific Coast, has devoted much attention to experiments prosecuted with a view to preserving exposed ironwork, and has demonstrated some things respecting this important matter that may be of great value. Mr. Heald some years ago had occasion to move a gas holder at Vallejo, and happened to notice on the old plates, which were badly corroded, that the "shipping marks" on the sheets were perfectly preserved. This led to the examination of other cases of the kind where marking had been done on ironwork, and also to experimenting with turpentine and white lead as a first coating to prevent rust. It is found that when surfaces are coated with finely ground lead thinned with spirits of turpentine, no corrosive action or scaling takes place, even when heavy coats of paint are afterward put on the outside. Mr. Heald says that the common paint mixed with oil is too thick to penetrate or close the imperfections of the surface and penetrate beneath the scale where it exists, thus leaving places for corrosion to begin beneath the paint. With turpentine and white lead mixed thin, the very pores of the iron are closed. The interstices, to so call them, are too minute to receive the body which oil gives, but are closed by the thinner compound. This is the theory, but that is a matter of no consequence so long as the fact is known.

The Market for Gas Securities.

The event of the week, among what are classed as the specialties lot on the Stock Exchange, was the sharp rise in Consolidated, which advanced to 85, on considerable dealings ; a reaction on Friday, however, driving it back to 83¾. There can be no doubt that this stock is bound to improve, and that it has attracted the regard of many institutions noted for their carefulness in investing their surplus funds, is shown by the fact that in the annual reports of several of these it is not an uncommon thing to find returned holdings of 500 and even 1,000 shares. Equitable, which is now selling ex-dividend, shows remarkable strength. Mutual is also higher. In Brooklyn shares save Nassau and old Brooklyn, a drooping tendency is noted. There seems to be no particular reason for this, unless it be the continued inroads on the street lighting made by the "Ring" electric lighting companies ; of course, the Citizens Company's shares are affected by the recent disaster, but we fail to see why its proprietors, when they shall have collected their insurance, will not be better off than they were a month ago. Among local sales at auction we note the following : 25 Williamsburgh, at 120, and 10 Fulton-Municipal, at 125¾. Also, 100 shares Municipal (Rochester, N. Y.) at 50. The old Rochester Company is distributing a semi-annual dividend of 3 per cent. Chicago Trusts are weaker. The Boston situation is decidedly mixed. We have it on good authority that all the branches of the banking firm of Brown Bros., at least in this country, deny any connection with the proposed Boston bonding purchase arrangement, and the belief steadily strengthens that the old Company's lease of independent life is not yet to end. Other Eastern shares are firm, and by way of showing what cheap gas can do in the matter of elevating gas share prices, we simply repeat the figure of last sales in Lowell gas—$200. The Louisville Company has enjoyed an extremely prosperous year. San Francisco shares are, as a rule, higher. One very reassuring circumstance is the appearance of several Southern companies in the market as borrowers of money on gilt-edged security. The moneys are needed to pay for what virtually amounts to new works construction. Capt. Keiser seems to have a firmer hold than ever on the St. Louis situation.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

JANUARY 21.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	83½	—
Central	440,000	50	—	60
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	113	116
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	98	100
" Bonds	1,500,000	1000	100	102
Municipal, Bonds	750,000		—	—
Northern	125,000	50	35	—
" Scrip	108,000			
Yonkers		50	90	100
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—

Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	103	105
Citizens	1,200,000	20	45	55
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	125	130
" Bonds	300,000		—	106
Peoples	1,000,000	10	72	74
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	85	88
Nassau	1,000,000	25	110	112
" Ctfs	700,000	1000	100	103
Williamsburgh	1,000,000	50	120	122
" Bonds	1,000,000	—	111	112
Out of Town Gas Companies.				
Boston (Mass.) Gas Co	2,500,000	500	200	—
Buffalo Mutual, N. Y	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	—	—
" " Bonds	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	35⅛	35⅝
Cincinnati G. & C. Co	6,000,000	100	187½	188¾
Consumers Toronto	1,000,000	50	192	—
Central, S. F., Cal			—	90
Capital, Sacramento, Cal.			58	—
Consolidated, Balt	11,000,000	100	47¼	47½
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	—	125
Jersey City	750,000	20	165	170
Laclede, St. Louis, Mo.	2,000,000	100	—	115
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	207	—
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds	240,000	100	103	—
New Haven, Conn		25	193	197
Oakland, Cal			—	35½
Peoples, Jersey City		—	60	61
" " Bonds			—	—
Paterson, N. J		25	90	—
Rochester, N. Y		50	75	80
Syracuse, N. Y	500,000	25	—	—
St. Louis, Missouri	600,000	50	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	59½	59¾
Washington, D. C	2,000,000	20	200	201
Wilmington, Del		50	200	208

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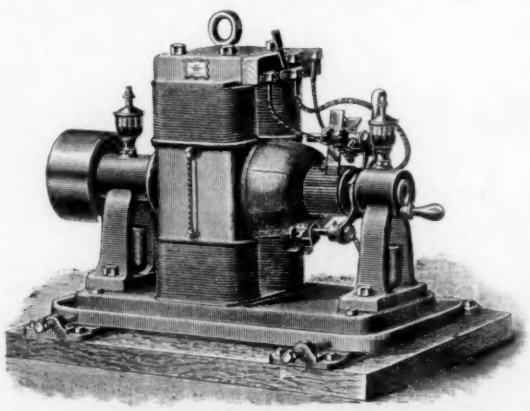
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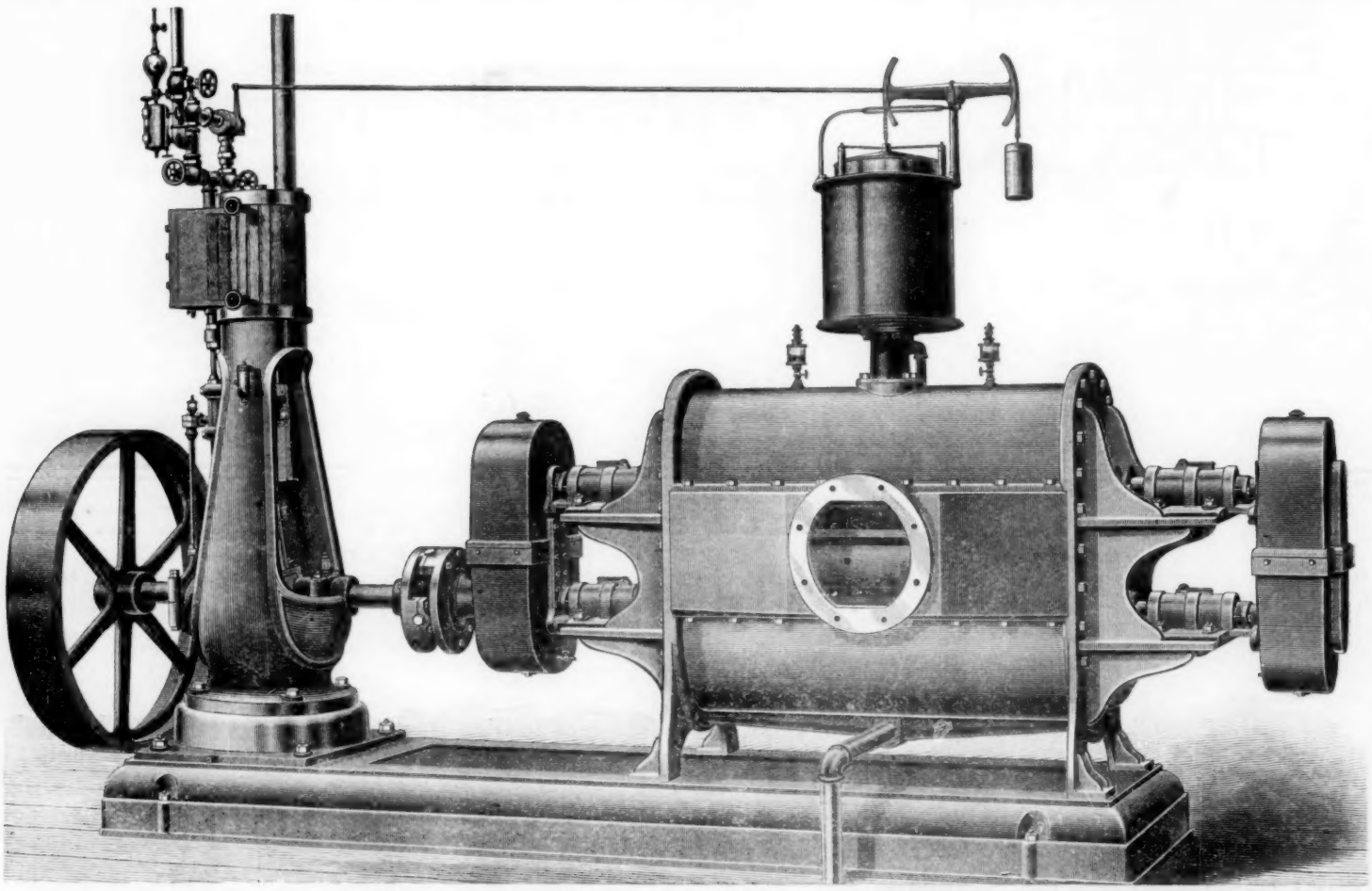

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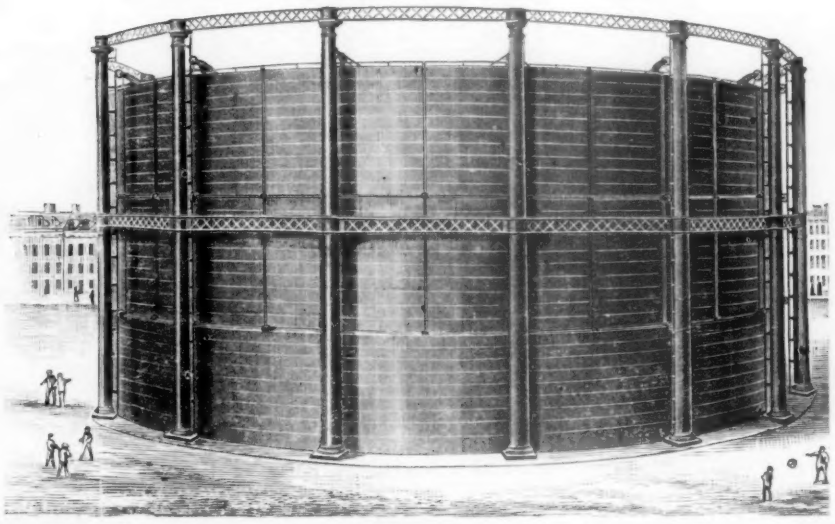

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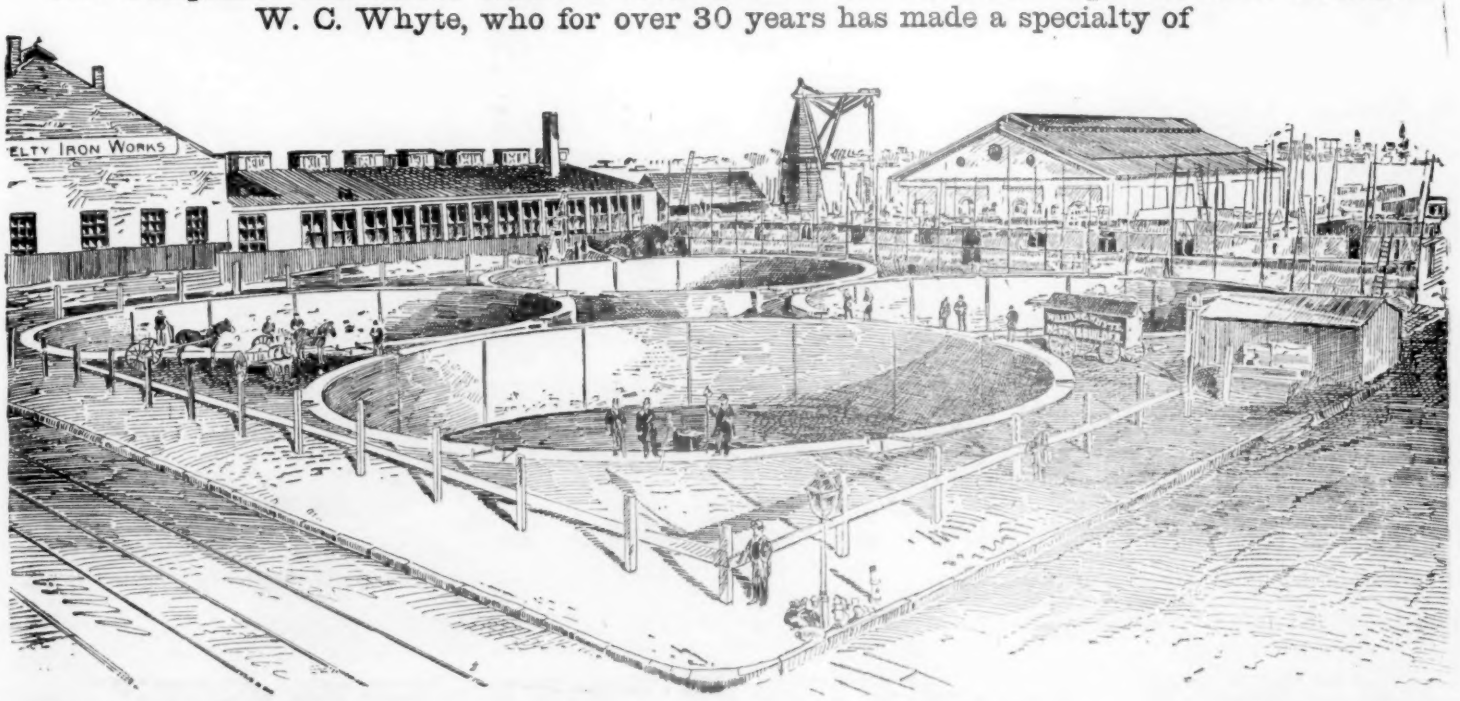

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No. 5,	"	"	750,000	"	"	"	7	"	"	"	"
No. 6,	"	"	1,000,000	"	"	"	8	"	"	"	"
No. 7,	"	"	1,250,000	"	"	"	9	"	"	"	"
No. 8,	"	"	1,500,000	"	"	"	10	"	"	"	"
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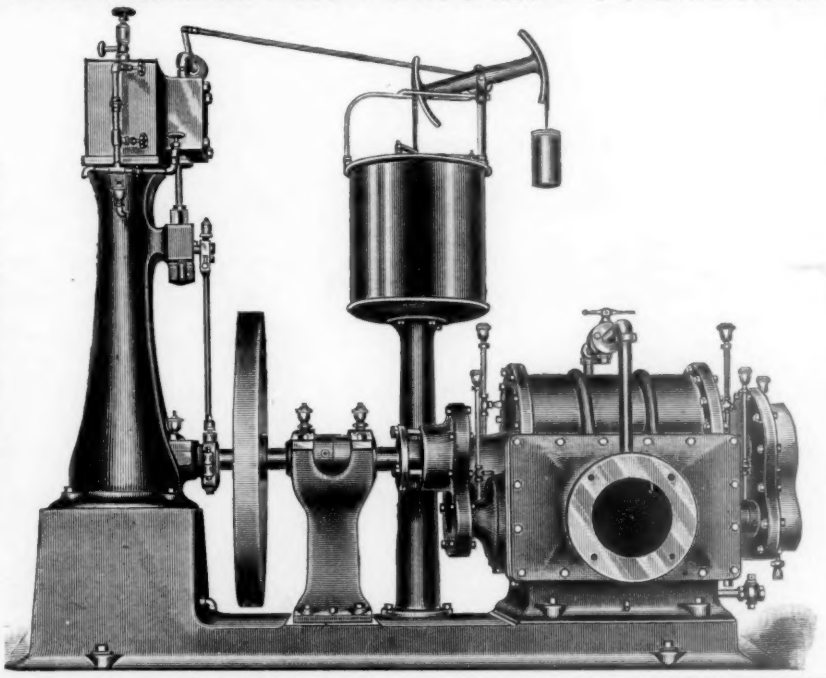

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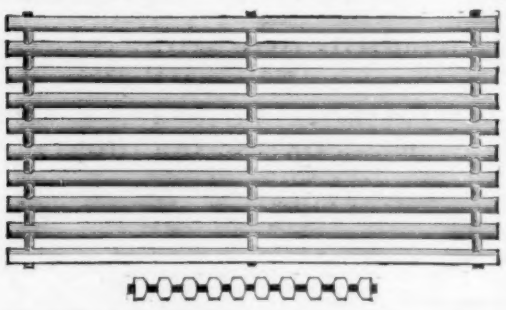

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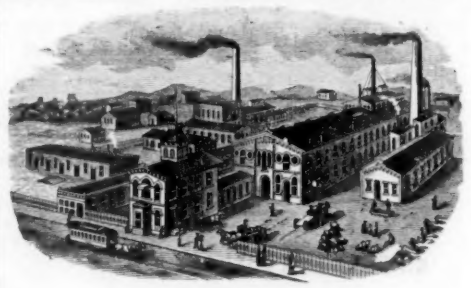

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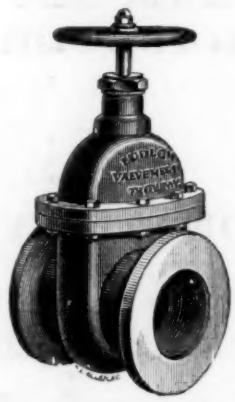

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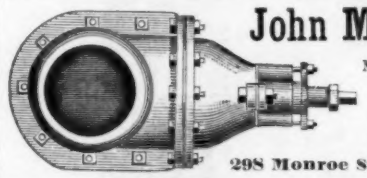

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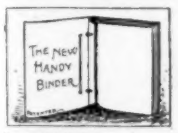

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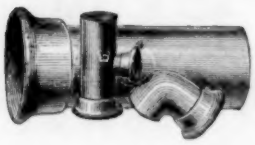

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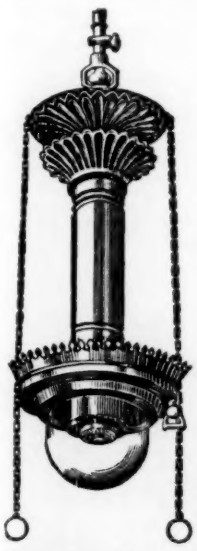

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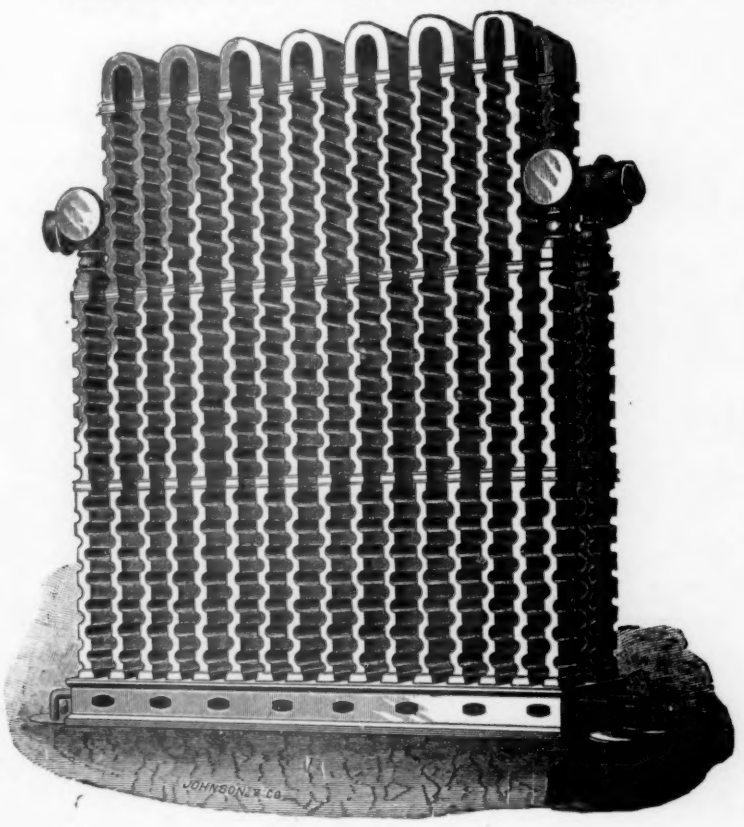

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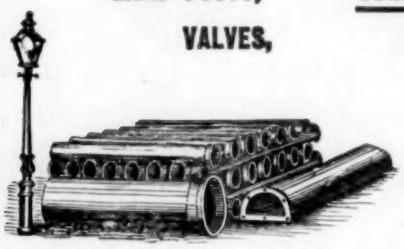

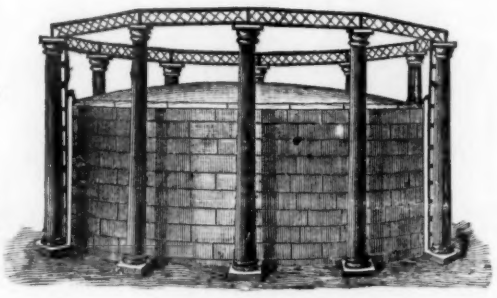

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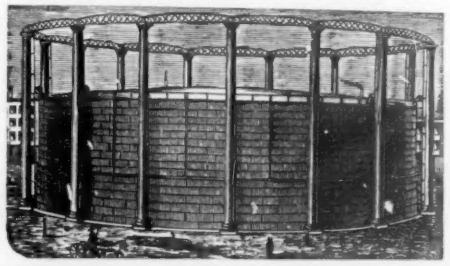
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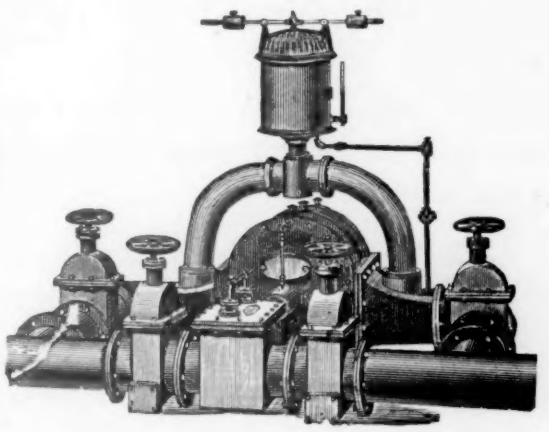

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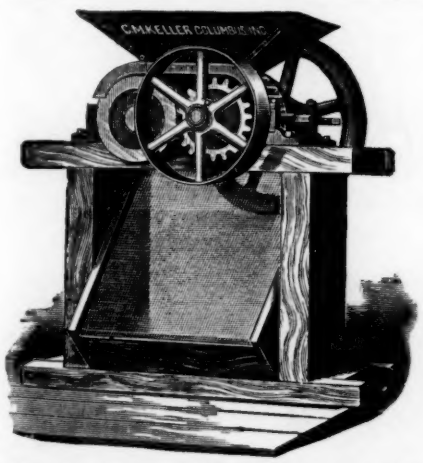

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This Stove has four burners on top, and double oven burner.

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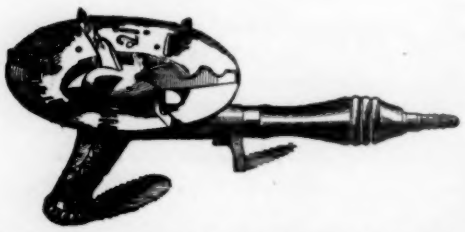

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